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REPORT

OF THE

TESTS OF METALS

AND

OTHER MATERIALS

FOR

INDUSTRIAL PURPOSES

MADE WITH THE

UNITED STATES TESTING MACHINE AT WATERTOWN ARSENAL, MASSACHUSETTS,

DURING

THE YEAR ENDED JUNE 30, 1886.

IN TWO PARTS.

PART II.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1889.

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1866
2

6137744

SPECIMENS FROM WHITWORTH STEEL JACKET

FOR

10-INCH STEEL B. L. RIFLE NO. 1.

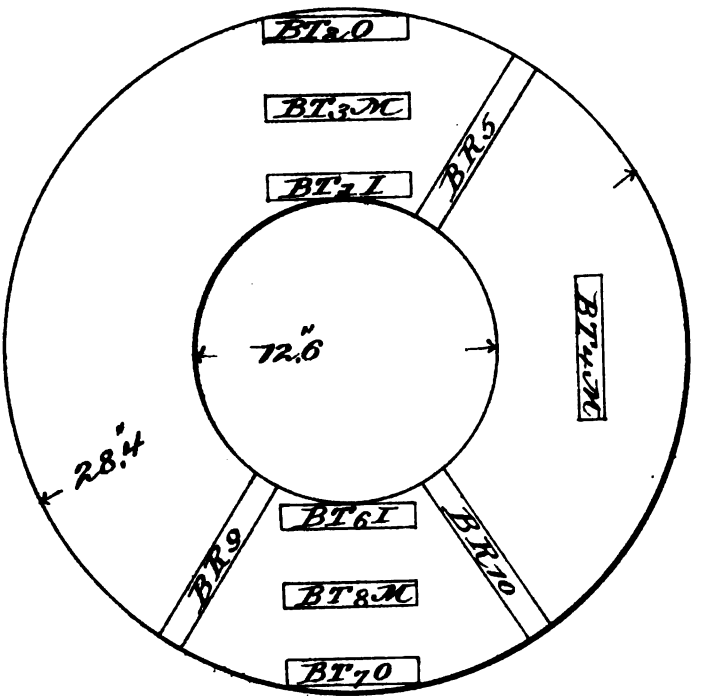
H. Ex. 31——63

26976 15

10" Steel B.L. Rifle No. 1.

Jacket

Breech end



H Ex 31 492

SPECIMENS FROM WHITWORTH STEEL JACKET FOR 10-I
B. L. RIFLE NO. 1.

No. 2652.

Marks, 10 R, J / B T, I
Diameter, .564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Ren
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
250	1,000	0.	0.	0.	0.	Initial load
1,250	5,000	.000167	.000167	0.		
2,500	10,000	.000333	.000166	0.		
3,750	15,000	.000433	.000100	0.		
5,000	20,000	.000633	.000200	0.		
6,250	25,000	.000767	.000134	0.		
7,500	30,000	.000967	.000200	0.		
8,750	35,000	.001167	.000200			
9,000	36,000	.001233	.000066			
9,250	37,000	.001267	.000034			
9,500	38,000	.001333	.000066			
9,750	39,000	.001367	.000034			Elastic lim
10,000	40,000	.001500	.000133			
10,250	41,000	.001600	.000100			
10,500	42,000	.001667	.000067			
10,750	43,000	.001767	.000100			
11,000	44,000	.001900	.000133			
11,500	46,000	.002033	.000133			
12,000	48,000	.002267	.000234			
12,500	50,000	.002500	.000233			
13,000	52,000	.002933	.000433			
13,500	54,000	.003300	.000367			
14,000	56,000	.004167	.000867			
14,250	57,000	.004500	.000333			
14,500	58,000	.005267	.000767			
14,750	59,000	.005933	.000666			
15,000	60,000	.006833	.000900			
15,500	62,000	.007667	.000824			
16,000	64,000	.008433	.000766			
16,500	66,000	.009333	.000900			
17,000	68,000	.010033	.000700			
17,500	70,000	.010833	.000800			
18,000	72,000	.011767	.000934			
18,500	74,000	.013500	.001733			
19,000	76,000	.015500	.002000			
19,500	78,000	.017333	.001833			
20,000	80,000	.019400	.002067			
20,500	82,000	.021667	.002267			
21,000	84,000	.023967	.002300			
21,500	86,000	.026500	.002533			
22,000	88,000	.029167	.002667			
22,500	90,000	.032333	.003166			
23,000	92,000	.035333	.003000			
23,500	94,000	.0400	.004667			
23,640	94,560	.0433	.0033			
		.0500	.0067			
		.0567	.0067			
		.0667	.0100			
		.0733	.0066			
		.1000	.0267			
		.1233	.0233			Tensile str

General summary.

Tensile strength per square inch of original section ..... po
Elastic limit per square inch of original section (not well defined) .....
Elongation per inch after rupture .....
Elongation per inch under strain at elastic limit .....
Reduction in diameter at point of rupture .....
Reduction in area after rupture, per centum of original section .....
Position of rupture .....
Character of rupture surface .....
Elongation of inch sections .....

No. 2653.

Marks, $\frac{10\ R_1\ J}{B\ T_2\ O}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	.....	
2,500	10,000	.000400	.000233	0.	.....	
3,750	15,000	.000600	.000200	0.	.....	
5,000	20,000	.000767	.000167	0.	.....	
6,250	25,000	.000967	.000200	0.	.....	
7,500	30,000	.001167	.000200	0.	.....	
8,750	35,000	.001333	.000166	.....	.....	
9,000	36,000	.001367	.000034	.....	.....	
9,250	37,000	.001400	.000033	.....	.....	
9,500	38,000	.001433	.000033	.....	.....	
9,750	39,000	.001467	.000034	.....	.....	
10,000	40,000	.001533	.000066	.....	.....	
10,250	41,000	.001567	.000034	.....	.....	
10,500	42,000	.001667	.000100	.....	.....	
10,750	43,000	.001733	.000066	.....	.....	
11,000	44,000	.001767	.000034	.....	.....	
11,250	45,000	.001833	.000066	.....	.....	Elastic limit.
11,500	46,000	.001967	.000134	.....	.....	
11,750	47,000	.002033	.000066	.....	.....	
12,000	48,000	.002133	.000100	.....	.....	
12,250	49,000	.002233	.000100	.....	.....	
12,500	50,000	.002433	.000200	.000700	.000700	
12,750	51,000	.002633	.000200	.....	.....	
13,000	52,000	.003000	.000367	.....	.....	
13,250	53,000	.003633	.000633	.....	.....	
13,500	54,000	.004433	.000800	.....	.....	
13,750	55,000	.005332	.000900	.....	.....	
14,000	56,000	.006400	.001067	.....	.....	
14,250	57,000	.007400	.001000	.....	.....	
14,500	58,000	.008400	.001000	.....	.....	
14,750	59,000	.009433	.001033	.....	.....	
15,000	60,000	.010667	.001234	.....	.....	
15,500	62,000	.012733	.002066	.....	.....	
16,000	64,000	.014900	.002167	.....	.....	
16,500	66,000	.017067	.002167	.....	.....	
17,000	68,000	.019400	.002333	.....	.....	
17,500	70,000	.021733	.002333	.....	.....	
18,000	72,000	.024833	.003100	.....	.....	
18,500	74,000	.027667	.002834	.....	.....	
19,000	76,000	.0300	.002333	.....	.....	
19,500	78,000	.0333	.0033	.....	.....	
20,000	80,000	.0367	.0034	.....	.....	
20,500	82,000	.0400	.0033	.....	.....	
21,000	84,000	.0467	.0067	.....	.....	
21,500	86,000	.0533	.0066	.....	.....	
22,000	88,000	.0667	.0034	.....	.....	
22,500	90,000	.0767	.0100	.....	.....	
22,810	91,240	.1067	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,240
Elastic limit per square inch of original section (approximate)	do...	45,000
Elongation per inch after rupture	inch..	0.1800
Elongation per inch under strain at elastic limit	do...	.001833
Reduction in diameter at point of rupture	do...	.154
Reduction in area after rupture, per centum of original section		47.2
Position of rupture		".65 from neck
Character of broken surface		silky
Elongation of inch sections		".14, ".30*, ".10

No. 2654.

Marks, $\frac{10\ R,\ J}{B\ T,\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1, 000	0.	0.	0.	0.	Initial load.
1, 250	5, 000	.000200	.000200	.000033	.000033	
2, 500	10, 000	.000400	.000200	.000033	0.	
3, 750	15, 000	.000567	.000167	.000033	0.	
5, 000	20, 000	.000700	.000133	.000033	0.	
6, 250	25, 000	.000900	.000200	.000067	.000034	
7, 500	30, 000	.001067	.000167	.000067	0.	
7, 750	31, 000	.001133	.000066	.....	.....	
8, 000	32, 000	.001167	.000034	.....	.....	
8, 250	33, 000	.001200	.000033	.....	.....	
8, 500	34, 000	.001267	.000067	.....	.....	Elastic limit.
8, 750	35, 000	.001500	.000233	.000267	.000200	
9, 000	36, 000	.001600	.000100	.....	.....	
9, 250	37, 000	.001700	.000100	.....	.....	
9, 500	38, 000	.001800	.000100	.....	.....	
9, 750	39, 000	.002000	.000200	.....	.....	
10, 000	40, 000	.002333	.000333	.....	.....	
10, 250	41, 000	.002667	.000334	.....	.....	
10, 500	42, 000	.003367	.000700	.....	.....	
10, 750	43, 000	.004067	.000700	.....	.....	
11, 000	44, 000	.004733	.000666	.....	.....	
11, 250	45, 000	.005367	.000634	.....	.....	
11, 500	46, 000	.006167	.000800	.....	.....	
11, 750	47, 000	.007067	.000900	.....	.....	
12, 000	48, 000	.008167	.001100	.....	.....	
12, 250	49, 000	.009067	.000900	.....	.....	
12, 500	50, 000	.009833	.000766	.....	.....	
13, 000	52, 000	.011500	.001667	.....	.....	
13, 500	54, 000	.013667	.002167	.....	.....	
14, 000	56, 000	.015400	.001733	.....	.....	
14, 500	58, 000	.017500	.002100	.....	.....	
15, 000	60, 000	.019700	.002200	.....	.....	
15, 500	62, 000	.022333	.002633	.....	.....	
16, 000	64, 000	.025000	.002667	.....	.....	
16, 500	66, 000	.027667	.002667	.....	.....	
17, 000	68, 000	.030667	.003000	.....	.....	
17, 500	70, 000	.034067	.003400	.....	.....	
18, 000	72, 000	.038333	.004266	.....	.....	
18, 500	74, 000	.0433	.004967	.....	.....	
19, 000	76, 000	.0500	.0067	.....	.....	
19, 500	78, 000	.0567	.0067	.....	.....	
20, 000	80, 000	.0633	.0066	.....	.....	
20, 500	82, 000	.0700	.0067	.....	.....	
21, 000	84, 000	.0933	.0233	.....	.....	
21, 360	85, 440	.1367	.0434	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	85, 440
Elastic limit per square inch of original section	do ..	34, 000
Elongation per inch after rupture	inch..	0. 1667
Elongation per inch under strain at elastic limit	do ..	.001267
Reduction in diameter at point of rupture	do...	.101
Reduction in area after rupture, per centum of original section		33 5
Position of rupture		1″.50 from neck
Character of broken surface	granular; dull eccentric spot	
Elongation of inch sections		″.12, ″.26, ″.12

No. 2653.

Marks, $\frac{10\ R_1\ J}{B\ T_2\ O}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	.....	
2,500	10,000	.000400	.000233	0.	.....	
3,750	15,000	.000600	.000200	0.	.....	
5,000	20,000	.000767	.000167	0.	.....	
6,250	25,000	.000967	.000200	0.	.....	
7,500	30,000	.001167	.000200	0.	.....	
8,750	35,000	.001333	.000166	.....	.....	
9,000	36,000	.001367	.000034	.....	.....	
9,250	37,000	.001400	.000033	.....	.....	
9,500	38,000	.001433	.000033	.....	.....	
9,750	39,000	.001467	.000034	.....	.....	
10,000	40,000	.001533	.000066	.....	.....	
10,250	41,000	.001567	.000034	.....	.....	
10,500	42,000	.001667	.000100	.....	.....	
10,750	43,000	.001733	.000066	.....	.....	
11,000	44,000	.001767	.000034	.....	.....	
11,250	45,000	.001833	.000066	.....	.....	Elastic limit.
11,500	46,000	.001967	.000134	.....	.....	
11,750	47,000	.002033	.000066	.....	.....	
12,000	48,000	.002133	.000100	.....	.....	
12,250	49,000	.002233	.000100	.....	.....	
12,500	50,000	.002433	.000200	.000700	.000700	
12,750	51,000	.002633	.000200	.....	.....	
13,000	52,000	.003000	.000367	.....	.....	
13,250	53,000	.003633	.000633	.....	.....	
13,500	54,000	.004433	.000800	.....	.....	
13,750	55,000	.005332	.000900	.....	.....	
14,000	56,000	.006400	.001067	.....	.....	
14,250	57,000	.007400	.001000	.....	.....	
14,500	58,000	.008400	.001000	.....	.....	
14,750	59,000	.009433	.001033	.....	.....	
15,000	60,000	.010667	.001234	.....	.....	
15,500	62,000	.012733	.002066	.....	.....	
16,000	64,000	.014900	.002167	.....	.....	
16,500	66,000	.017067	.002167	.....	.....	
17,000	68,000	.019400	.002333	.....	.....	
17,500	70,000	.021733	.002333	.....	.....	
18,000	72,000	.024833	.003100	.....	.....	
18,500	74,000	.027667	.002834	.....	.....	
19,000	76,000	.0300	.002333	.....	.....	
19,500	78,000	.0333	.0033	.....	.....	
20,000	80,000	.0367	.0034	.....	.....	
20,500	82,000	.0400	.0033	.....	.....	
21,000	84,000	.0467	.0067	.....	.....	
21,500	86,000	.0533	.0066	.....	.....	
22,000	88,000	.0667	.0034	.....	.....	
22,500	90,000	.0767	.0100	.....	.....	
22,810	91,240	.1067	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,240
Elastic limit per square inch of original section (approximate)	do...	45,000
Elongation per inch after rupture	inch..	0.1800
Elongation per inch under strain at elastic limit	do...	.001833
Reduction in diameter at point of rupture	do...	.154
Reduction in area after rupture, per centum of original section		47.2
Position of rupture		".65 from neck
Character of broken surface		silky
Elongation of inch sections		".14, ".30", ".10

No. 2654.

Marks, $\overset{10\ R,\ J}{B\ T,\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	.1,000	0.	0.	0.	0.	Initial load.
1, 250	5, 000	.000200	.000200	.000033	.000033	
2, 500	10, 000	.000400	.000200	.000033	0.	
3, 750	15, 000	.000567	.000167	.000033	0.	
5, 000	20, 000	.000700	.000133	.000033	0.	
6, 250	25, 000	.000900	.000200	.000067	.000034	
7, 500	30, 000	.001067	.000167	.000067	0.	
7, 750	31, 000	.001133	.000066	.....	.....	
8, 000	32, 000	.001167	.000034	.....	.....	
8, 250	33, 000	.001200	.000033	.....	.....	
8, 500	34, 000	.001267	.000067	.....	.....	Elastic limit.
8, 750	35, 000	.001500	.000233	.000267	.000200	
9, 000	36, 000	.001600	.000100	.....	.....	
9, 250	37, 000	.001700	.000100	.....	.....	
9, 500	38, 000	.001800	.000100	.....	.....	
9, 750	39, 000	.002000	.000200	.....	.....	
10, 000	40, 000	.002333	.000333	.....	.....	
10, 250	41, 000	.002667	.000334	.....	.....	
10, 500	42, 000	.003367	.000700	.....	.....	
10, 750	43, 000	.004067	.000700	.....	.....	
11, 000	44, 000	.004733	.000666	.....	.....	
11, 250	45, 000	.005367	.000634	.....	.....	
11, 500	46, 000	.006167	.000800	.....	.....	
11, 750	47, 000	.007067	.000900	.....	.....	
12, 000	48, 000	.008167	.001100	.....	.....	
12, 250	49, 000	.009067	.000900	.....	.....	
12, 500	50, 000	.009833	.000766	.....	.....	
13, 000	52, 000	.011500	.001667	.....	.....	
13, 500	54, 000	.013667	.002167	.....	.....	
14, 000	56, 000	.015400	.001733	.....	.....	
14, 500	58, 000	.017500	.002100	.....	.....	
15, 000	60, 000	.019700	.002200	.....	.....	
15, 500	62, 000	.022333	.002633	.....	.....	
16, 000	64, 000	.025000	.002667	.....	.....	
16, 500	66, 000	.027667	.002667	.....	.....	
17, 000	68, 000	.030667	.003000	.....	.....	
17, 500	70, 000	.034067	.003400	.....	.....	
18, 000	72, 000	.038333	.004266	.....	.....	
18, 500	74, 000	.0433	.004967	.....	.....	
19, 000	76, 000	.0500	.0067	.....	.....	
19, 500	78, 000	.0567	.0067	.....	.....	
20, 000	80, 000	.0633	.0066	.....	.....	
20, 500	82, 000	.0700	.0067	.....	.....	
21, 000	84, 000	.0933	.0233	.....	.....	
21, 360	85, 440	.1367	.0434	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	85, 440
Elastic limit per square inch of original section	do...	34, 000
Elongation per inch after rupture	inch..	0. 1667
Elongation per inch under strain at elastic limit	do...	.001267
Reduction in diameter at point of rupture	do...	.101
Reduction in area after rupture, per centum of original section		33 5
Position of rupture		1″.50 from neck
Character of broken surface		granular; dull eccentric spot
Elongation of inch sections		″.12, ″.26, ″.12

No. 2655.

Marks, $\frac{10\ R,\ J}{B\ T,\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000200	.000200	0.	.....	
2,500	10,000	.000400	.000200	0.	.....	
3,750	15,000	.000600	.000200	0.	.....	
5,000	20,000	.000767	.000167	0.	.....	
6,250	25,000	.000900	.000133	0.	.....	
7,500	30,000	.001200	.000300	.000167	.000167	Elastic limit.
7,750	31,000	.001267	.000067	.....	.....	
8,000	32,000	.001367	.000100	.....	.....	
8,250	33,000	.001433	.000066	.....	.....	
8,500	34,000	.001667	.000234	.....	.....	
8,750	35,000	.001800	.000133	.000600	.000433	
9,000	36,000	.002033	.000233	.....	.....	
9,250	37,000	.002333	.000300	.....	.....	
9,500	38,000	.002767	.000434	.....	.....	
9,750	39,000	.003167	.000400	.....	.....	
10,000	40,000	.003833	.000666	.....	.....	
10,250	41,000	.004500	.000667	.....	.....	
10,500	42,000	.005167	.000667	.....	.....	
10,750	43,000	.005833	.000666	.....	.....	
11,000	44,000	.006667	.000834	.....	.....	
11,250	45,000	.007333	.000666	.....	.....	
11,500	46,000	.008200	.000867	.....	.....	
11,750	47,000	.009100	.000900	.....	.....	
12,000	48,000	.010000	.000900	.....	.....	
12,250	49,000	.010833	.000833	.....	.....	
12,500	50,000	.011733	.000900	.....	.....	
13,000	52,000	.013733	.002000	.....	.....	
13,500	54,000	.015567	.001834	.....	.....	
14,000	56,000	.017867	.002300	.....	.....	
14,500	58,000	.020000	.002133	.....	.....	
15,000	60,000	.022500	.002500	.....	.....	
15,500	62,000	.025167	.002667	.....	.....	
16,000	64,000	.028000	.002833	.....	.....	
16,500	66,000	.031067	.003067	.....	.....	
17,000	68,000	.034667	.003600	.....	.....	
17,500	70,000	.038333	.003666	.....	.....	
18,000	72,000	.0433	.004967	.....	.....	
18,500	74,000	.0500	.0067	.....	.....	
19,000	76,000	.0567	.0067	.....	.....	
19,500	78,000	.0633	.0066	.....	.....	
20,000	80,000	.0733	.0100	.....	.....	
20,500	82,000	.0933	.0200	.....	.....	
21,000	84,000	.1333	.0400	.....	.....	
21,010	84,040	.1433	.0100	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	84,040
Elastic limit per square inch of original section	do...	30,000
Elongation per inch after rupture	inch..	0.1900
Elongation per inch under strain at elastic limit	do...	.001200
Reduction in diameter at point of rupture	do...	.104
Reduction in area after rupture, per centum of original section		33.5
Position of rupture		¾ inch from neck
Character of broken surface		granular; dull spot at circumference
Elongation of inch sections		″.14, ″.15, ″.28*

No. 2656.

Marks, $^{10\ R,\ J}_{B\ R,}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.		
2,500	10,000	.000233	.000100	0.		
3,750	15,000	.000333	.000100	0.		
5,000	20,000	.000467	.000134	0.		
6,250	25,000	.000633	.000166	0.		
7,500	30,000	.000800	.000167	0.		
7,750	31,000	.000833	.000033			
8,000	32,000	.000867	.000034			
8,250	33,000	.000967	.000100			
8,500	34,000	.001033	.000066			
8,750	35,000	.001100	.000067	.000067	.000067	
9,000	36,000	.001167	.000067			Elastic limit.
9,250	37,000	.001267	.000100			
9,500	38,000	.001400	.000133			
9,750	39,000	.001533	.000133			
10,000	40,000	.001700	.000167	.000467	.000400	
10,250	41,000	.001900	.000200			
10,500	42,000	.002100	.000200			
10,750	43,000	.002433	.000333			
11,000	44,000	.002967	.000534			
11,250	45,000	.003433	.000466			
11,500	46,000	.004067	.000634			
11,750	47,000	.004833	.000766			
12,000	48,000	.005667	.000834			
12,250	49,000	.006433	.000766			
12,500	50,000	.007400	.000967			
13,000	52,000	.009333	.001933			
13,500	54,000	.011000	.001667			
14,000	56,000	.013000	.002000			
14,500	58,000	.015000	.002000			
15,000	60,000	.017167	.002167			
15,500	62,000	.019667	.002500			
16,000	64,000	.021700	.002033			
16,500	66,000	.024500	.002800			
17,000	68,000	.027333	.002833			
17,500	70,000	.030000	.002667			
18,000	72,000	.033333	.003333			
18,500	74,000	.0400	.006667			
19,000	76,000	.0467	.0067			
19,500	78,000	.0533	.0066			
20,000	80,000	.0600	.0067			
20,500	82,000	.0667	.0067			
21,000	84,000	.0732	.0066			
21,500	86,000	.0900	.0167			
21,780	87,120	.1233	.0333			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	87,120
Elastic limit per square inch of original section	do...	36,000
Elongation per inch after rupture	inch..	0.1333
Elongation per inch under strain at elastic limit	do...	.001167
Reduction in diameter at point of rupture	do...	.054
Reduction in area after rupture, per centum of original section		18.3
Position of rupture		".15 from neck
Character of broken surface		granular; dull eccentric spot
Elongation of inch sections		".08, ".11, ".21*

No. 687.

Marks, $\frac{10\ R_1\ J}{B\ T_6\ I}$
Length, 5″.007
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	0.	.....	
5,000	10,000	.000267	.000167	0.	.....	
7,500	15,000	.000433	.000166	0.	.....	
10,000	20,000	.000600	.000167	0.	.....	
12,500	25,000	.000767	.000167	0.	.....	
15,000	30,000	.000933	.000166	0.	.....	
17,500	35,000	.001100	.000167	.....	.....	
20,000	40,000	.001233	.000133	.....	.....	
22,500	45,000	.001333	.000100	.....	.....	
25,000	50,000	.001500	.000167	.....	.....	
25,500	51,000	.001533	.000033	.....	.....	
26,000	52,000	.001567	.000034	.....	.....	
26,500	53,000	.001567	0.	.....	.....	
27,000	54,000	.001600	.000033	.....	.....	
27,500	55,000	.001633	.000033	.....	.....	
28,000	56,000	.001633	0.	.....	.....	
28,500	57,000	.001667	.000034	.....	.....	
29,000	58,000	.001700	.000033	.....	.....	
29,500	59,000	.001767	.000067	.....	.....	
30,000	60,000	.001833	.000066	.....	.....	Elastic limit.
30,500	61,000	.001933	.000100	.....	.....	
31,000	62,000	.002167	.000234	.....	.....	
31,500	63,000	.002400	.000233	.....	.....	
32,000	64,000	.002833	.000433	.....	.....	
32,500	65,000	.003267	.000434	.....	.....	
33,000	66,000	.003933	.000666	.....	.....	
33,500	67,000	.004833	.000900	.....	.....	
34,000	68,000	.005067	.001134	.....	.....	
46,600	93,200	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	60,000
Compression per inch under stress at elastic limit	inch..	0.001833
Ultimate strength per square inch of original section	pounds..	93,200
Manner of failure		triple flexure

No. 688.

Marks, $\frac{10\ R_1\ J}{B\ T,\ O}$
Length, 5″.004.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	0.	.....	
5,000	10,000	.000267	.000167	0.	.....	
7,500	15,000	.000433	.000166	0.	.....	
10,000	20,000	.000633	.000200	0.	.....	
12,500	25,000	.000833	.000200	0.	.....	
15,000	30,000	.001033	.000200	.000033	.000033	
17,500	35,000	.001200	.000167	.....	.....	
20,000	40,000	.001367	.000167	.....	.....	
22,500	45,000	.001667	.000300	.....	.....	
23,000	46,000	.001733	.000066	.....	.....	
23,500	47,000	.001833	.000100	.....	.....	
24,000	48,000	.001900	.000067	.....	.....	Elastic limit
24,500	49,000	.002033	.000133	.....	.....	
25,000	50,000	.002200	.000167	.....	.....	
25,500	51,000	.002533	.000333	.....	.....	
26,000	52,000	.003100	.000567	.....	.....	
26,500	53,000	.003300	.000200	.....	.....	
27,000	54,000	.003567	.000267	.....	.....	
27,500	55,000	.003733	.000166	.....	.....	
28,000	56,000	.004000	.000267	.....	.....	
40,550	81,100	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	48,000
Compression per inch under stress at elastic limit	inch..	0.001900
Ultimate strength per square inch of original section	pounds.	81,100
Manner of failure..		triple flexure

No. 689.

Marks, $\frac{10\ R,\ J}{B\ T,\ M}$
Length, 5″.005.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000067	.000067	0.	.....	
5,000	10,000	.000233	.000166	0.	.....	
7,500	15,000	.000400	.000167	0.	.....	
10,000	20,000	.000600	.000200	0.	.....	
12,500	25,000	.000767	.000167	0.	.....	
15,000	30,000	.001000	.000233	.000033	.000033	
15,500	31,000	.001067	.000067	.....	.....	
16,000	32,000	.001133	.000066	.....	.....	Elastic limit.
16,500	33,000	.001400	.000267	.....	.....	
17,000	34,000	.001633	.000233	.....	.....	
17,500	35,000	.001867	.000234	.000667	.000634	
18,000	36,000	.002100	.000233	.....	.....	
18,500	37,000	.002433	.000333	.....	.....	
19,000	38,000	.003000	.000567	.....	.....	
19,500	39,000	.003400	.000400	.....	.....	
20,000	40,000	.004100	.000700	.....	.....	
20,500	41,000	.004567	.000467	.....	.....	
21,000	42,000	.005400	.000833	.....	.....	
38,100	76,320	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	32,000
Compression per inch under stress at elastic limit	inch..	0.001133
Ultimate strength per square inch of original section	pounds..	76,320
Manner of failure		triple flexure

No. 690.

Marks, $\frac{10\ R,\ J}{B\ R,}$
Length, 5″.001.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000067	.000067	0.	.....	
5,000	10,000	.000233	.000166	0.	.....	
7,500	15,000	.000400	.000167	0.	.....	
10,000	20,000	.000567	.000167	0.	.....	
12,500	25,000	.000733	.000166	0.	.....	
15,000	30,000	.000900	.000167	0.	.....	
17,500	35,000	.001067	.000167	.....	.....	
18,000	36,000	.001100	.000033	.....	.....	Elastic limit.
18,500	37,000	.001333	.000233	.....	.....	
19,000	38,000	.001567	.000234	.....	.....	
19,500	39,000	.001833	.000266	.....	.....	
20,000	40,000	.002067	.000234	.....	.....	
20,500	41,000	.002433	.000366	.....	.....	
21,000	42,000	.002867	.000434	.....	.....	
21,500	43,000	.003300	.000433	.....	.....	
22,000	44,000	.003833	.000533	.....	.....	
22,500	45,000	.004400	.000567	.....	.....	
23,000	46,000	.005000	.000600	.....	.....	
40,260	80,520	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	36,000
Compression per inch under stress at elastic limit	inch..	0.001100
Ultimate strength per square inch of original section	pounds..	80,520
Manner of failure		triple flexure
Specific gravity (outside)		7.8635

No. 691.

Marks, $\frac{10\ R_1\ J}{B\ R_{10}}$
Length, 5″.007.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	0.	.....	
5,000	10,000	.000267	.000167	0.	.....	
7,500	15,000	.000433	.000166	0.	.....	
10,000	20,000	.000600	.000167	0.	.....	
12,500	25,000	.000767	.000167	0.	.....	
15,000	30,000	.000933	.000166	.000033	.000033	
17,500	35,000	.001233	.000300	.000133	.000100	Elastic limit.
18,000	36,000	.001367	.000134	.....	.....	
18,500	37,000	.001567	.000200	.....	.....	
19,000	38,000	.001900	.000333	.....	.....	
19,500	39,000	.002200	.000300	.....	.....	
20,000	40,000	.002533	.000333	.....	.....	
20,500	41,000	.003033	.000500	.....	.....	
21,000	42,000	.003500	.000467	.....	.....	
21,500	43,000	.004067	.000567	.....	.....	
22,000	44,000	.004533	.000466	.....	.....	
22,500	45,000	.005167	.000634	.....	.....	
23,000	46,000	.006200	.001033	.....	.....	
40,740	81,480	.....	.....	.....	.....	Ultimate strength.

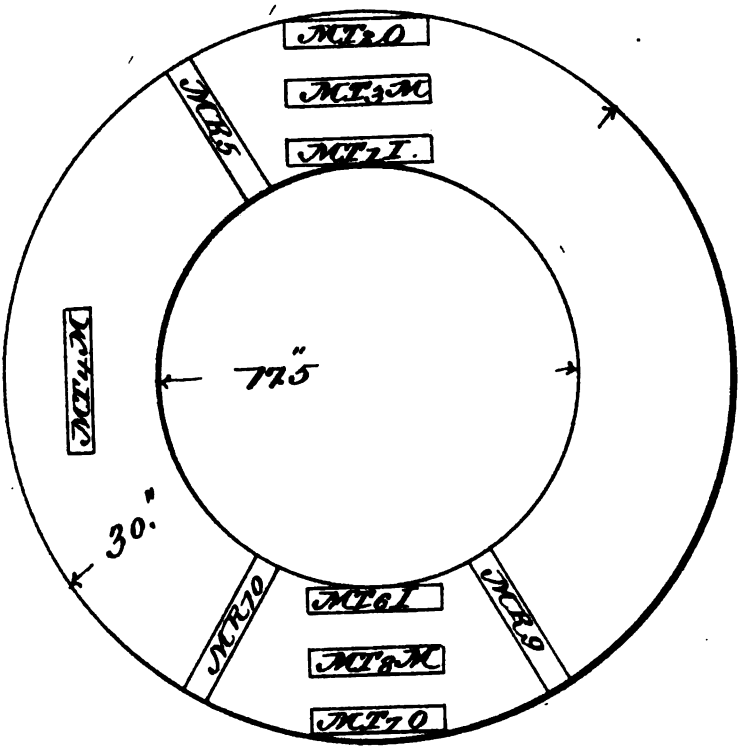
General summary.

Elastic limit per square inch of original section	pounds..	35,000
Compression per inch under stress at elastic limit	inch..	0.001233
Ultimate strength per square inch of original section	pounds..	81,480
Manner of failure		triple flexure
Specific gravity (inside)		7.8610

10" Steel B.L. Rifle No. 1.

Jacket

Muzzle end.



H Ex 31 492

No. 2647.

Marks, $\frac{10\ R_1\ J}{M\ T_1\ I}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000200	.000200	0.	.....	
2,500	10,000	.000367	.000167	0.	.....	
3,750	15,000	.000533	.000166	0.	.....	
5,000	20,000	.000700	.000167	0.	.....	
6,250	25,000	.000867	.000167	0.	.....	
7,500	30,000	.001033	.000166	0.	.....	
7,750	31,000	.001067	.000034	0.	.....	
8,000	32,000	.001133	.000066	0.	.....	
8,250	33,000	.001167	.000034	0.	.....	
8,500	34,000	.001200	.000033	0.	.....	
8,750	35,000	.001267	.000067	0.	.....	
9,000	36,000	.001300	.000033	.....	.....	
9,250	37,000	.001367	.000067	.....	.....	Elastic limit.
9,500	38,000	.001467	.000100	.....	.....	
9,750	39,000	.002533	.001066	.....	.....	
10,000	40,000	.003000	.000467	.....	.....	
10,250	41,000	.003667	.000667	.....	.....	
10,500	42,000	.004433	.000766	.....	.....	
10,750	43,000	.005133	.000700	.....	.....	
11,000	44,000	.005700	.000567	.....	.....	
11,250	45,000	.006600	.000900	.....	.....	
11,500	46,000	.007367	.000767	.....	.....	
12,000	48,000	.009067	.001700	.....	.....	
12,500	50,000	.011000	.001933	.....	.....	
13,000	52,000	.013000	.002000	.....	.....	
13,500	54,000	.015067	.002067	.....	.....	
14,000	56,000	.017500	.002433	.....	.....	
14,500	58,000	.020000	.002500	.....	.....	
15,000	60,000	.022833	.002833	.....	.....	
15,500	62,000	.026000	.003167	.....	.....	
16,000	64,000	.029000	.003000	.....	.....	
16,500	66,000	.032667	.003667	.....	.....	
17,000	68,000	.036667	.004000	.....	.....	
17,500	70,000	.0400	.003333	.....	.....	
18,000	72,000	.0500	.0100	.....	.....	
18,500	74,000	.0600	.0100	.....	.....	
19,000	76,000	.0667	.0067	.....	.....	
19,500	78,000	.0733	.0066	.....	.....	
20,000	80,000	.0967	.0234	.....	.....	
20,500	82,000	.1367	.0400	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	82,000
Elastic limit per square inch of original section	do...	37,000
Elongation per inch after rupture	inch..	0.2000
Elongation per inch under strain at elastic limit	do...	.001367
Reduction in diameter at point of rupture	do...	.164
Reduction in area after rupture, per centum of original section		49.7
Position of rupture		1".26 from neck
Character of broken surface		silky
Elongation of inch sections		".08, ".26, ".26*

No. 2648.

Marks, $\frac{10\ R,\ J}{M\ T_2\ O}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000233	.000233	0.	.....	
2,500	10,000	.000433	.000200	0.	.....	
3,750	15,000	.000633	.000200	0.	.....	
5,000	20,000	.000800	.000167	0.	.....	
6,250	25,000	.000967	.000167	0.	.....	
7,500	30,000	.001167	.000200	.000033	.000033	
7,750	31,000	.001167	0.	.....	.....	
8,000	32,000	.001200	.000033	.....	.....	
8,250	33,000	.001233	.000033	.....	.....	
8,500	34,000	.001267	.000034	.....	.....	
8,750	35,000	.001300	.000033	.....	.....	
9,000	36,000	.001333	.000033	.....	.....	
9,250	37,000	.001367	.000034	.....	.....	
9,500	38,000	.001400	.000033	.....	.....	
9,750	39,000	.001433	.000033	.....	.....	
10,000	40,000	.001467	.000034	.....	.....	
10,250	41,000	.001500	.000033	.....	.....	
10,500	42,000	.001533	.000033	.....	.....	
10,750	43,000	.001600	.000067	.....	.....	
11,000	44,000	.001667	.000067	.....	.....	Elastic limit.
11,250	45,000	.001767	.000100	.....	.....	
11,500	46,000	.002100	.000333	.....	.....	
11,750	47,000	.004133	.002033	.....	.....	
12,000	48,000	.004733	.000600	.....	.....	
12,250	49,000	.005367	.000634	.....	.....	
12,500	50,000	.005967	.000600	.....	.....	
12,750	51,000	.006667	.000700	.....	.....	
13,000	52,000	.007567	.000900	.....	.....	
13,500	54,000	.009267	.001700	.....	.....	
14,000	56,000	.011033	.001766	.....	.....	
14,500	58,000	.012900	.001867	.....	.....	
15,000	60,000	.014833	.001933	.....	.....	
15,500	62,000	.016900	.002067	.....	.....	
16,000	64,000	.019767	.002867	.....	.....	
16,500	66,000	.021700	.001933	.....	.....	
17,000	68,000	.024333	.002633	.....	.....	
17,500	70,000	.027233	.002900	.....	.....	
18,000	72,000	.030167	.002934	.....	.....	
18,500	74,000	.034000	.003833	.....	.....	
19,000	76,000	.0367	.0027	.....	.....	
19,500	78,000	.0400	.0033	.....	.....	
20,000	80,000	.0467	.0067	.....	.....	
20,500	82,000	.0567	.0100	.....	.....	
21,000	84,000	.0667	.0100	.....	.....	
21,500	86,000	.0767	.0100	.....	.....	
22,000	88,000	.0967	.0200	.....	.....	
22,500	90,000	.1367	.0400	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	90,000
Elastic limit per square inch of original section	do...	44,000
Elongation per inch after rupture	inch..	0.1967
Elongation per inch under strain at elastic limit	do...	.001667
Reduction in diameter at point of rupture	do...	.154
Reduction in area after rupture, per centum of original section		47.2
Position of rupture		".70 from neck
Character of broken surface		silky; trace of granulation
Elongation of inch sections		".36", ".13, ".10

No. 2649.

Marks, $\frac{10\ R_1\ I}{M\ T_2\ M}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000267	.000167	0.	.....	
3,750	15,000	.000433	.000166	0.	.....	
5,000	20,000	.000600	.000167	0.	.....	
6,250	25,000	.000800	.000200	0.	.....	
7,500	30,000	.001033	.000233	.....	.....	
7,750	31,000	.001067	.000034	.....	.....	
8,000	32,000	.001100	.000033	.....	.....	
8,250	33,000	.001133	.000033	.....	.....	
8,500	34,000	.001167	.000034	.....	.....	
8,750	35,000	.001200	.000033	.....	.....	
9,000	36,000	.001267	.000067	.....	.....	
9,250	37,000	.001300	.000033	.....	.....	
9,500	38,000	.001367	.000067	.....	.....	
9,750	39,000	.001467	.000100	.....	.....	Elastic limit.
10,000	40,000	.005900	.004433	.....	.....	
10,250	41,000	.006333	.000433	.....	.....	
10,500	42,000	.007333	.001000	.....	.....	
10,750	43,000	.008100	.000767	.....	.....	
11,000	44,000	.009000	.000900	.....	.....	
11,500	46,000	.010933	.001933	.....	.....	
12,000	48,000	.012667	.001734	.....	.....	
12,500	50,000	.014933	.002266	.....	.....	
13,000	52,000	.017267	.002334	.....	.....	
13,500	54,000	.019700	.002433	.....	.....	
14,000	56,000	.022267	.002567	.....	.....	
14,500	58,000	.025400	.003133	.....	.....	
15,000	60,000	.028367	.002967	.....	.....	
15,500	62,000	.032000	.003633	.....	.....	
16,000	64,000	.036033	.004033	.....	.....	
16,500	66,000	.0400	.003967	.....	.....	
17,000	68,000	.0467	.0067	.....	.....	
17,500	70,000	.0567	.0100	.....	.....	
18,000	72,000	.0667	.0100	.....	.....	
18,500	74,000	.0733	.0066	.....	.....	
19,000	76,000	.0900	.0167	.....	.....	
19,500	78,000	.1067	.0167	.....	.....	
20,000	80,000	.1467	.0400	.....	.....	
20,100	80,400	.2000	.0533	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	80,400
Elastic limit per square inch of original section	do...	39,000
Elongation per inch after rupture	inch..	0.2600
Elongation per inch under strain at elastic limit	do ..	.001467
Reduction in diameter at point of rupture	do...	.144
Reduction in area after rupture, per centum of original section		44.6
Position of rupture		at middle of stem
Character of broken surface		silky; trace of granulation; opened cracks in surface of stem
Elongation of inch sections		".18, ".42*, ".18

No. 2648.

Marks, $\frac{10\ R,\ J}{M\ T,\ O}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000233	.000233	0.		
2,500	10,000	.000433	.000200	0.		
3,750	15,000	.000633	.000200	0.		
5,000	20,000	.000800	.000167	0.		
6,250	25,000	.000967	.000167	0.		
7,500	30,000	.001167	.000200	.000033	.000033	
7,750	31,000	.001167	0.			
8,000	32,000	.001200	.000033			
8,250	33,000	.001233	.000033			
8,500	34,000	.001267	.000034			
8,750	35,000	.001300	.000033			
9,000	36,000	.001333	.000033			
9,250	37,000	.001367	.000034			
9,500	38,000	.001400	.000033			
9,750	39,000	.001433	.000033			
10,000	40,000	.001467	.000034			
10,250	41,000	001500	.000033			
10,500	42,000	.001533	.000033			
10,750	43,000	.001600	.000067			
11,000	44,000	.001667	.000067			Elastic limit.
11,250	45,000	.001767	.000100			
11,500	46,000	.002100	.000333			
11,750	47,000	.004133	.002033			
12,000	48,000	.004733	.000600			
12,250	49,000	.005367	.000634			
12,500	50,000	.005967	.000600			
12,750	51,000	.006667	.000700			
13,000	52,000	.007567	.000900			
13,500	54,000	.009267	.001700			
14,000	56,000	.011033	.001766			
14,500	58,000	.012900	.001867			
15,000	60,000	.014833	.001933			
15,500	62,000	.016900	.002067			
16,000	64,000	.019767	.002867			
16,500	66,000	.021700	.001933			
17,000	68,000	.024333	.002633			
17,500	70,000	.027233	.002900			
18,000	72,000	.030167	.002934			
18,500	74,000	.034000	.003833			
19,000	76,000	.0367	.0027			
19,500	78,000	.0400	.0033			
20,000	80,000	.0467	.0067			
20,500	82,000	.0567	.0100			
21,000	84,000	.0667	.0100			
21,500	86,000	.0767	.0100			
22,000	88,000	.0967	.0200			
22,500	90,000	.1367	.0400			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	90,000
Elastic limit per square inch of original section	do...	44,000
Elongation per inch after rupture	inch..	0.1967
Elongation per inch under strain at elastic limit	do...	.001667
Reduction in diameter at point of rupture	do...	.154
Reduction in area after rupture, per centum of original section		47.2
Position of rupture		″.70 from neck
Character of broken surface		silky; trace of granulation
Elongation of inch sections		″.36, ″.13, ″.10

No. 2649.

Marks, $\frac{10\,R_1\,I}{M\,T_1\,M}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000267	.000167	0.	.....	
3,750	15,000	.000433	.000166	0.	.....	
5,000	20,000	.000600	.000167	0.	.....	
6,250	25,000	.000800	.000200	0.	.....	
7,500	30,000	.001033	.000233	.....	.....	
7,750	31,000	.001067	.000034	.....	.....	
8,000	32,000	.001100	.000033	.....	.....	
8,250	33,000	.001133	.000033	.....	.....	
8,500	34,000	.001167	.000034	.....	.....	
8,750	35,000	.001200	.000033	.....	.....	
9,000	36,000	.001267	.000067	.....	.....	
9,250	37,000	.001300	.000033	.....	.....	
9,500	38,000	.001367	.000067	.....	.....	
9,750	39,000	.001467	.000100	.....	.....	Elastic limit.
10,000	40,000	.005900	.004433	.....	.....	
10,250	41,000	.006333	.000433	.....	.....	
10,500	42,000	.007333	.001000	.....	.....	
10,750	43,000	.008100	.000767	.....	.....	
11,000	44,000	.009000	.000900	.....	.....	
11,500	46,000	.010933	.001933	.....	.....	
12,000	48,000	.012667	.001734	.....	.....	
12,500	50,000	.014933	.002266	.....	.....	
13,000	52,000	.017267	.002334	.....	.....	
13,500	54,000	.019700	.002433	.....	.....	
14,000	56,000	.022267	.002567	.....	.....	
14,500	58,000	.025400	.003133	.....	.....	
15,000	60,000	.028367	.002967	.....	.....	
15,500	62,000	.032000	.003633	.....	.....	
16,000	64,000	.036033	.004033	.....	.....	
16,500	66,000	.0400	.003967	.....	.....	
17,000	68,000	.0467	.0067	.....	.....	
17,500	70,000	.0567	.0100	.....	.....	
18,000	72,000	.0667	.0100	.....	.....	
18,500	74,000	.0733	.0066	.....	.....	
19,000	76,000	.0900	.0167	.....	.....	
19,500	78,000	.1067	.0167	.....	.....	
20,000	80,000	.1467	.0400	.....	.....	
20,100	80,400	.2000	.0533	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	80,400
Elastic limit per square inch of original section	do	39,000
Elongation per inch after rupture	inch	0.2000
Elongation per inch under strain at elastic limit	do	.001467
Reduction in diameter at point of rupture	do	.144
Reduction in area after rupture, per centum of original section		44.6
Position of rupture		at middle of stem
Character of broken surface		silky; trace of granulation; opened cracks in surface of stem
Elongation of inch sections		".18, ".42", ".18

No. 2650.

Marks, $\frac{10\ R_1\ J}{M\ T_4\ M}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000233	.000233	0.	.....	
2,500	10,000	.000467	.000234	0.	.....	
3,750	15,000	.000833	.000166	0.	.....	
5,000	20,000	.000833	.000200	0.	.....	
6,250	25,000	.000967	.000134	.000033	.000033	
7,500	30,000	.001100	.000133	.....	.....	
7,750	31,000	.001167	.000067	.....	.....	
8,000	32,000	.001200	.000033	.....	.....	
8,250	33,000	.001267	.000067	.....	.....	
8,500	34,000	.001300	.000033	.....	.....	
8,750	35,000	.001367	.000067	.....	.....	
9,000	36,000	.001400	.000033	.....	.....	
9,250	37,000	.001467	.000067	.....	.....	
9,500	38,000	.001500	.000033	.....	.....	Elastic limit.
9,750	39,000	.001633	.000133	.....	.....	
10,000	40,000	.006600	.004967	.....	.....	
10,250	41,000	.007100	.000500	.....	.....	
10,500	42,000	.007867	.000767	.....	.....	
10,750	43,000	.008600	.000733	.....	.....	
11,000	44,000	.009367	.000767	.....	.....	
11,250	45,000	.010267	.000900	.....	.....	
11,500	46,000	.011367	.001100	.....	.....	
12,000	48,000	.013133	.001766	.....	.....	
12,500	50,000	.015367	.002234	.....	.....	
13,000	52,000	.017667	.002300	.....	.....	
13,500	54,000	.020267	.002600	.....	.....	
14,000	56,000	.022800	.002533	.....	.....	
14,500	58,000	.026000	.003200	.....	.....	
15,000	60,000	.029100	.003100	.....	.....	
15,500	62,000	.032900	.003800	.....	.....	
16,000	64,000	.036833	.003933	.....	.....	
16,500	66,000	.0400	.003167	.....	.....	
17,000	68,000	.0467	.0067	.....	.....	
17,500	70,000	.0533	.0066	.....	.....	
18,000	72,000	.0600	.0067	.....	.....	
18,500	74,000	.0700	.0100	.....	.....	
19,000	76,000	.0900	.0200	.....	.....	
19,500	78,000	.1067	.0167	.....	.....	
20,000	80,000	.1500	.0433	.....	.....	
20,200	80,800	.2167	.0667	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	80,800
Elastic limit per square inch of original section	do	38,000
Elongation per inch after rupture	inch	0.2700
Elongation per inch under strain at elastic limit	do	.001500
Reduction in diameter at point of rupture	do	.164
Reduction in area after rupture, per centum of original section		49.7
Position of rupture		1".80 from neck
Character of broken surface		silky
Elongation of inch sections		".18, ".43*, ".20

No. 2651.

Marks, $\frac{10\ B_1\ J}{M\ R_8}$
Diameter, ".564."
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	.....	
2,500	10,000	.000167	.000100	0.	.....	
3,750	15,000	.000300	.000133	0.	.....	
5,000	20,000	.000467	.000167	0.	.....	
6,250	25,000	.000633	.000166	0.	.....	
7,500	30,000	.000867	.000234	0.	.....	
7,750	31,000	.000900	.000033	.....	.....	
8,000	32,000	.000967	.000067	.....	.....	
8,250	33,000	.001033	.000066	.....	.....	
8,500	34,000	.001133	.000100	.....	.....	Elastic limit.
8,750	35,000	.001300	.000167	.....	.....	
9,000	36,000	.002667	.001367	.....	.....	
9,250	37,000	.003533	.000866	.....	.....	
9,500	38,000	.004267	.000734	.....	.....	
9,750	39,000	.005033	.000766	.....	.....	
10,000	40,000	.005633	.000600	.....	.....	
10,250	41,000	.006267	.000634	.....	.....	
10,500	42,000	.007100	.000833	.....	.....	
10,750	43,000	.007900	.000800	.....	.....	
11,000	44,000	.008700	.000800	.....	.....	
11,250	45,000	.009900	.001200	.....	.....	
11,500	46,000	.010467	.000567	.....	.....	
12,000	48,000	.012700	.002233	.....	.....	
12,500	50,000	.014733	.002033	.....	.....	
13,000	52,000	.016967	.002234	.....	.....	
13,500	54,000	.019500	.002533	.....	.....	
14,000	56,000	.022000	.002500	.....	.....	
14,500	58,000	.025033	.003033	.....	.....	
15,000	60,000	.028000	.002967	.....	.....	
15,500	62,000	.031667	.003667	.....	.....	
16,000	64,000	.035333	.003666	.....	.....	
16,500	66,000	.0400	.004667	.....	.....	
17,000	68,000	.0433	.0033	.....	.....	
17,500	70,000	.0533	.0100	.....	.....	
18,000	72,000	.0600	.0067	.....	.....	
18,500	74,000	.0700	.0100	.....	.....	
19,000	76,000	.0833	.0133	.....	.....	
19,500	78,000	.1033	.0200	.....	.....	
20,000	80,000	.1333	.0300	.....	.....	
20,100	80,400	.1767	.0434	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	80,400
Elastic limit per square inch of original section	do...	34,000
Elongation per inch after rupture	inch..	0.2267
Elongation per inch under strain at elastic limit	do...	.001133
Reduction in diameter at point of rupture	do...	.144
Reduction in area after rupture, per centum of original section		44.6
Position of rupture	at middle of stem; oblique	
Character of broken surface	silky	
Elongation of inch sections	".13, ".39, ".16	

No. 682.

Marks, $\frac{10\ R_1\ J}{M\ T_4\ I}$
Length, 5″.004.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	0.	.....	
5,000	10,000	.000267	.000167	0.	.....	
7,500	15,000	.000433	.000166	0.	.....	
10,000	20,000	.000600	.000167	0.	.....	
12,500	25,000	.000767	.000167	0.	.....	
15,000	30,000	.000900	.000133	0.	.....	
15,500	31,000	.000933	.000033	.....	.....	
16,000	32,000	.000967	.000034	.....	.....	
16,500	33,000	.001000	.000033	.....	.....	
17,000	34,000	.001033	.000033	.....	.....	
17,500	35,000	.001100	.000067	.....	.....	
18,000	36,000	.001133	.000033	.....	.....	
18,500	37,000	.001167	.000034	.....	.....	
19,000	38,000	.001200	.000033	.....	.....	
19,500	39,000	.001233	.000033	.....	.....	
20,000	40,000	.001333	.000100	.....	.....	
20,500	41,000	.001333	0.	.....	.....	
21,000	42,000	.001400	.000067	.....	.....	
21,500	43,000	.001500	.000100	.....	.....	
22,000	44,000	.001567	.000067	.....	.....	
22,500	45,000	.001633	.000066	.....	.....	Elastic limit.
23,000	46,000	.001767	.000134	.....	.....	
23,500	47,000	.001933	.000166	.....	.....	
24,000	48,000	.002167	.000234	.....	.....	
24,500	49,000	.002567	.000400	.....	.....	
25,000	50,000	.002867	.000300	.....	.....	
25,500	51,000	.005000	.002133	.....	.....	
26,000	52,000	.005667	.000667	.....	.....	
26,500	53,000	.006167	.000500	.....	.....	
27,000	54,000	.006867	.000700	.....	.....	
27,500	55,000	.007733	.000866	.....	.....	
40,300	81,600	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	45,000
Compression per inch under stress at elastic limit	inch..	0.001633
Ultimate strength per square inch of original section	pounds..	81,600
Manner of failure		triple flexure

No. 683.

Marks, $\frac{10\ R,\ J}{M\ T,\ O}$
Length, 5″.005.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000133	.000133	0.	.....	
5,000	10,000	.000333	.000200	0.	.....	
7,500	15,000	.000500	.000167	0.	.....	
10,000	20,000	.000667	.000167	0.	.....	
12,500	25,000	.000833	.000166	0.	.....	
15,000	30,000	.001000	.000167	0.	.....	
15,500	31,000	.001000	0.	.....	.....	
16,000	32,000	.001033	.000033	.....	.....	
16,500	33,000	.001033	0.	.....	.....	
17,000	34,000	.001067	.000034	.....	.....	
17,500	35,000	.001133	.000066	.....	.....	
18,000	36,000	.001167	.000034	.....	.....	
18,500	37,000	.001167	0.	.....	.....	
19,000	38,000	.001167	0.	.....	.....	
19,500	39,000	.001233	.000066	.....	.....	
20,000	40,000	.001267	.000034	.....	.....	
20,500	41,000	.001300	.000033	.....	.....	
21,000	42,000	.001300	0.	.....	.....	
21,500	43,000	.001333	.000033	.....	.....	
22,000	44,000	.001367	.000034	.....	.....	
22,500	45,000	.001433	.000066	.....	.....	
23,000	46,000	.001467	.000034	.....	.....	
23,500	47,000	.001500	.000033	.....	.....	Elastic limit.
24,000	48,000	.001833	.000333	.....	.....	
24,500	49,000	.002600	.000767	.....	.....	
25,000	50,000	.003200	.000600	.....	.....	
25,500	51,000	.003667	.000467	.....	.....	
26,000	52,000	.004267	.000600	.....	.....	
26,500	53,000	.004833	.000566	.....	.....	
27,000	54,000	.005333	.000500	.....	.....	
27,500	55,000	.006000	.000667	.....	.....	
28,000	56,000	.006600	.000600	.....	.....	
43,200	86,400	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	47,000
Compression per inch under stress at elastic limit	inch..	0.001500
Ultimate strength per square inch of original section	pounds..	86,400
Manner of failure		triple flexure

No. 684.

Marks, $\frac{10\ R_1\ J}{M\ T_2\ M}$
Length, 5″.007.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	0.	.....	
5,000	10,000	.000300	.000200	0.	.....	
7,500	15,000	.000467	.000167	0.	.....	
10,000	20,000	.000633	.000166	0.	.....	
12,500	25,000	.000800	.000167	0.	.....	
15,000	30,000	.001000	.000200	0.	.....	
17,500	35,000	.001300	.000300	.000100	.000100	
18,000	36,000	.001333	.000033	.....	.....	Elastic limit.
18,500	37,000	.001500	.000167	.....	.....	
19,000	38,000	.004500	.003000	.....	.....	
19,500	39,000	.004933	.000433	.....	.....	
20,000	40,000	.005500	.000567	.....	.....	
20,500	41,000	.006100	.000600	.....	.....	
21,000	42,000	.006667	.000567	.....	.....	
21,500	43,000	.007333	.000666	.....	.....	
22,000	44,000	.008100	.000767	.....	.....	
22,500	45,000	.008833	.000733	.....	.....	
23,000	46,000	.009633	.000800	.....	.....	
23,500	47,000	.010367	.000734	.....	.....	
24,000	48,000	.011333	.000966	.....	.....	
24,500	49,000	.012167	.000834	.....	.....	
25,000	50,000	.012967	.000800	.....	.....	
36,900	73,800	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	36,000
Compression per inch under stress at elastic limit	inch..	0.001333
Ultimate strength per square inch of original section	pounds..	73,800
Manner of failure		triple flexure

No. 685.

Marks, $\frac{10\ R_1\ J}{M\ R_2}$
Length, 5″.001.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	0.	.....	
5,000	10,000	.000267	.000167	0.	.....	
7,500	15,000	.000467	.000200	0.	.....	
10,000	20,000	.000600	.000133	0.	.....	
12,500	25,000	.000767	.000167	0.	.....	
15,000	30,000	.000933	.000166	0.	.....	
17,500	35,000	.001133	.000200	.....	.....	
18,000	36,000	.001167	.000034	.....	.....	
18,500	37,000	.001200	.000033	.....	.....	
19,000	38,000	.001233	.000033	.....	.....	
19,500	39,000	.001300	.000067	.....	.....	
20,000	40,000	.001333	.000033	.....	.....	
20,500	41,000	.001367	.000034	.....	.....	
21,000	42,000	.001400	.000033	.....	.....	Elastic limit
21,500	43,000	.001500 .005507	.000100 .004007	.....	.....	
22,000	44,000	.007167	.001600	.....	.....	
22,500	45,000	.007933	.000766	.....	.....	
23,000	46,000	.008367	.000434	.....	.....	
35,850	71,700	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	42,000
Compression per inch under stress at elastic limit	inch..	0.001400
Ultimate strength per square inch of original section	pounds..	71,700
Manner of failure		triple flexure

No. 686.

Marks, $\frac{10\ R_1\ J}{M\ R_{10}}$
Length, 5″.007.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000067	.000067	0.	.....	
5,000	10,000	.000233	.000166	0.	.....	
7,500	15,000	.000400	.000167	0.	.....	
10,000	20,000	.000567	.000167	0.	.....	
12,500	25,000	.000733	.000166	0.	.....	
15,000	30,000	.000900	.000167	.000033	.000033	
17,500	35,000	.001067	.000167	.....	.....	
18,000	36,000	.001100	.000033	.....	.....	
18,500	37,000	.001133	.000033	.....	.....	
19,000	38,000	.001167	.000034	.....	.....	
19,500	39,000	.001200	.000033	.....	.....	
20,000	40,000	.001233	.000033	.....	.....	
20,500	41,000	.001267	.000034	.....	.....	
21,000	42,000	.001300	.000033	.....	.....	Elastic limit.
21,500	43,000	.004067	.002767	.....	.....	
22,000	44,000	.004967	.000900	.....	.....	
23,500	45,000	.005700	.000733	.....	.....	
24,000	46,000	.006900	.001200	.....	.....	
36,100	72,200	.....	.....	.....	.....	Ultimate strength.

General summary.

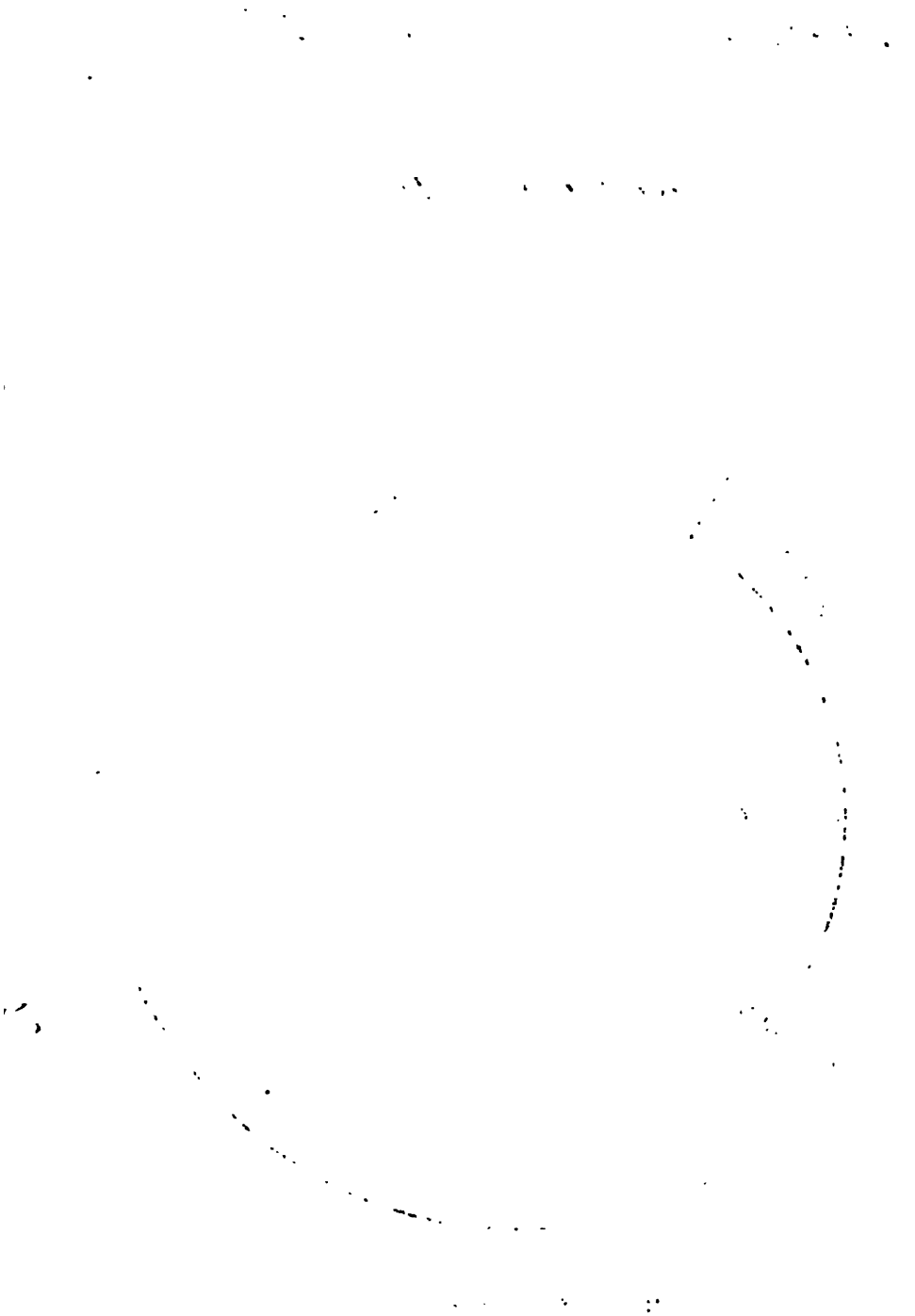
Elastic limit per square inch of original section	pounds..	42,000
Compression per inch under stress at elastic limit	inch..	0.001300
Ultimate strength per square inch of original section	pounds..	72,200
Manner of failure		triple flexure
Specific gravity		7.8677

SPECIMENS FROM WHITWORTH STEEL TRUNNION HOOP

FOR

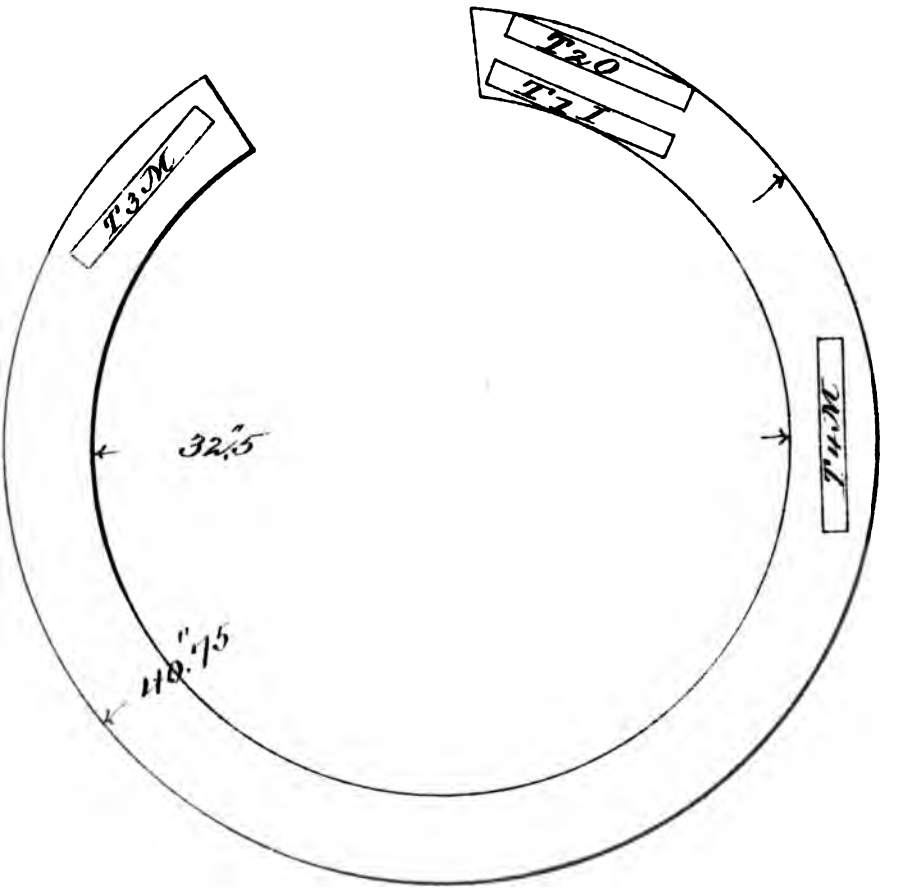
10-INCH STEEL B. L. RIFLE NO. 1.

1015



10" Steel B. L. Rifle No. 1.

Trunnion Hoop.



H Ex 31 492

SPECIMENS FROM WHITWORTH STEEL TRUNNION HOOP FOR 10-INCH STEEL B. L. RIFLE NO. 1.

No. 2746.

Marks, $\frac{10\ R;\ T\ H}{T;\ I}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000233	.000116	0.	.....	
3,750	15,000	.000400	.000167	0.	.....	
5,000	20,000	.000583	.000183	0.	.....	
6,250	25,000	.000783	.000200	0.	.....	
7,500	30,000	.000983	.000200	0.	.....	
7,750	31,000	.001017	.000034	.....	.....	
8,000	32,000	.001050	.000033	.....	.....	
8,250	33,000	.001100	.000050	.....	.....	
8,500	34,000	.001167	.000067	.....	.....	
8,750	35,000	.001200	.000033	.000050	.000050	
9,000	36,000	.001267	.000067	.....	.....	
9,250	37,000	.001317	.000050	.....	.....	
9,500	38,000	.001383	.000066	.....	.....	
9,750	39,000	.001433	.0000c0	.....	.....	Elastic limit.
10,000	40,000	.001533	.000100	.....	.....	
10,250	41,000	.001633	.000100	.....	.....	
10,500	42,000	.001817	.000184	.....	.....	
10,750	43,000	.002017	.000200	.....	.....	
11,000	44,000	.002267	.000250	.....	.....	
11,250	45,000	.002650	.000383	.....	.....	
11,500	46,000	.003167	.000517	.....	.....	
11,750	47,000	.003700	.000533	.....	.....	
12,000	48,000	.004500	.000800	.....	.....	
12,250	49,000	.005133	.000633	.....	.....	
12,500	50,000	.006167	.001034	.....	.....	
13,000	52,000	.008000	.001833	.....	.....	
13,500	54,000	.010667	.002667	.....	.....	
14,000	56,000	.012500	.001833	.....	.....	
14,500	58,000	.014167	.001667	.....	.....	
15,000	60,000	.016500	.002333	.....	.....	
15,500	62,000	.019000	.002500	.....	.....	
16,000	64,000	.021417	.002417	.....	.....	
16,500	66,000	.024167	.002750	.....	.....	
17,000	68,000	.0283	.004133	.....	.....	
17,500	70,000	.0317	.0034	.....	.....	
18,000	72,000	.0350	.0033	.....	.....	
18,500	74,000	.0383	.0033	.....	.....	
19,000	76,000	.0450	.0067	.....	.....	
19,500	78,000	.0517	.0067	.....	.....	
20,000	80,000	.0600	.0083	.....	.....	
20,500	82,000	.0750	.0150	.....	.....	
20,740	82,960	.0950	.0200	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	82,960
Elastic limit per square inch of original section	do...	39,000
Elongation per inch after rupture	inch..	0.1333
Elongation per inch under strain at elastic limit	do...	.001433
Reduction in diameter at point of rupture	do...	.184
Reduction in area after rupture, per centum of original section		54.6
Position of rupture		½ inch from neck
Character of broken surface		silky
Elongation of inch sections		".40", ".13, ".08, ".07, ".06, ".06

No. 2747.

Marks, $\frac{10\ R_1\ T\ H}{T_1\ O}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000283	.000166	0.	.....	
3,750	15,000	.000450	.000167	0.	.....	
5,000	20,000	.000617	.000167	0.	.....	
6,250	25,000	.000800	.000183	0.	.....	
7,500	30,000	.000983	.000183	0.	.....	
7,750	31,000	.001000	.000017	.....	.....	
8,000	32,000	.001050	.000050	.....	.....	
8,250	33,000	.001083	.000033	.....	.....	
8,500	34,000	.001133	.000050	.....	.....	
8,750	35,000	.001150	.000017	.000017	.000017	
9,000	36,000	.001217	.000067	.....	.....	
9,250	37,000	.001250	.000033	.....	.....	
9,500	38,000	.001300	.000050	.....	.....	
9,750	39,000	.001333	.000033	.....	.....	
10,000	40,000	.001383	.000050	.....	.....	
10,250	41,000	.001450	.000067	.....	.....	
10,500	42,000	.001500	.000050	.....	.....	Elastic limit.
10,750	43,000	.001600	.000100	.....	.....	
11,000	44,000	.001817	.000217	.....	.....	
11,250	45,000	.002133	.000316	.....	.....	
11,500	46,000	.002683	.000550	.....	.....	
11,750	47,000	.003167	.000484	.....	.....	
12,000	48,000	.004000	.000833	.....	.....	
12,250	49,000	.004700	.000700	.....	.....	
12,500	50,000	.005833	.001133	.....	.....	
12,750	51,000	.006750	.000917	.....	.....	
13,000	52,000	.007833	.001083	.....	.....	
13,250	53,000	.008800	.000967	.....	.....	
13,500	54,000	.009833	.001033	.....	.....	
14,000	56,000	.011667	.001834	.....	.....	
14,500	58,000	.014050	.002383	.....	.....	
15,000	60,000	.016333	.002283	.....	.....	
15,500	62,000	.018833	.002500	.....	.....	
16,000	64,000	.021333	.002500	.....	.....	
16,500	66,000	.024167	.002834	.....	.....	
17,000	68,000	.0283	.004133	.....	.....	
17,500	70,000	.0317	.0034	.....	.....	
18,000	72,000	.0350	.0033	.....	.....	
18,500	74,000	.0383	.0033	.....	.....	
19,000	76,000	.0450	.0067	.....	.....	
19,500	78,000	.0500	.0050	.....	.....	
20,000	80,000	.0600	.0100	.....	.....	
20,500	82,000	.0683	.0083	.....	.....	
21,000	84,000	.0883	.0200	.....	.....	
21,360	85,440	.1317	.0434	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	85,440
Elastic limit per square inch of original section	do...	42,000
Elongation per inch after rupture	inch..	0.1733
Elongation per inch under strain at elastic limit	do...	.001500
Reduction in diameter at point of rupture	do ..	.204
Reduction in area after rupture, per centum of original section		59.3
Position of rupture		2".10 from neck
Character of broken surface		silky
Elongation of inch sections		".09, ".42", ".17, ".11, ".14, ".11

No. 2748.

Marks, $\frac{10\ R;\ T\ H}{T,\ M}$
Diameter, ″.564.
Sectional area, .50 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	.....	.....	
2,500	10,000	.000317	.000167	.....	.....	
3,750	15,000	.000483	.000166	.....	.....	
5,000	20,000	.000650	.000167	.....	.....	
6,250	25,000	.000817	.000167	.....	.....	
7,500	30,000	.001050	.000233	.000083	.000083	
7,750	31,000	.001100	.000050	.....	.....	
8,000	32,000	.001167	.000067	.....	.....	
8,250	33,000	.001217	.000050	.....	.....	
8,500	34,000	.001283	.000066	.....	.....	
8,750	35,000	.001333	.000050	.000183	.000100	Elastic limit.
9,000	36,000	.001500	.000067	.....	.....	
9,250	37,000	.001633	.000133	.....	.....	
9,500	38,000	.001833	.000200	.....	.....	
9,750	39,000	.002167	.000334	.....	.....	
10,000	40,000	.002700	.000533	.....	.....	
10,250	41,000	.003133	.000433	.....	.....	
10,500	42,000	.003883	.000750	.....	.....	
10,750	43,000	.004583	.000700	.....	.....	
11,000	44,000	.005417	.000834	.....	.....	
11,250	45,000	.006267	.000850	.....	.....	
11,500	46,000	.007183	.000916	.....	.....	
11,750	47,000	.008267	.001084	.....	.....	
12,000	48,000	.009517	.001250	.....	.....	
12,250	49,000	.010417	.000900	.....	.....	
12,500	50,000	.011417	.001000	.....	.....	
13,000	52,000	.013717	.002300	.....	.....	
13,500	54,000	.015917	.002200	.....	.....	
14,000	56,000	.018583	.002666	.....	.....	
14,500	58,000	.021167	.002584	.....	.....	
15,000	60,000	.024250	.003083	.....	.....	
15,500	62,000	.0283	.004050	.....	.....	
16,000	64,000	.0317	.0034	.....	.....	
16,500	66,000	.0350	.0033	.....	.....	
17,000	68,000	.0383	.0033	.....	.....	
17,500	70,000	.0467	.0084	.....	.....	
18,000	72,000	.0538	.0066	.....	.....	
18,500	74,000	.0617	.0084	.....	.....	
19,000	76,000	.0717	.0100	.....	.....	
19,500	78,000	.0917	.0200	.....	.....	
19,880	79,520	.1367	.0450	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	79,520
Elastic limit per square inch of original section	do...	35,000
Elongation per inch after rupture	inch..	0.1333
Elongation per inch under strain at elastic limit	do...	.001333
Reduction in diameter at point of rupture	do...	.194
Reduction in area after rupture, per centum of original section		57.0
Position of rupture		½ inch from neck
Character of broken surface		silky
Elongation of inch sections		″.43, ″.16, ″.15, ″.13, ″.11, ″.12

No. 2749.

Marks, $\frac{10\ R,\ T\ H}{T_4\ M}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.		
2,500	10,000	.000283	.000166	0.		
3,750	15,000	.000450	.000167	0.		
5,000	20,000	.000617	.000167	0.		
6,250	25,000	.000783	.000166	0.		
7,500	30,000	.000967	.000184	0.		
7,750	31,000	.001000	.000033			
8,000	32,000	.001083	.000033			
8,250	33,000	.001067	.000034			
8,500	34,000	.001117	.000050			
8,750	35,000	.001167	.000050	0.		
9,000	36,000	.001183	.000016			
9,250	37,000	.001217	.000034			
9,500	38,000	.001267	.000050			
9,750	39,000	.001300	.000033			
10,000	40,000	.001333	.000033			
10,250	41,000	.001367	.000034			
10,500	42,000	.001417	.000050			
10,750	43,000	.001450	.000033			Elastic limit.
11,000	44,000	.001550	.000100			
11,250	45,000	.002233	.000683			
11,500	46,000	.003500	.001267			
11,750	47,000	.004183	.000683			
12,000	48,000	.005750	.000567			
12,250	49,000	.007167	.001417			
12,500	50,000	.009750	.002583			
12,750	51,000	.011167	.001417			
13,000	52,000	.011833	.000666			
13,250	53,000	.012167	.000334			
13,500	54,000	.013167	.001000			
13,750	55,000	.014167	.001000			
14,000	56,000	.015200	.001033			
14,500	58,000	.017500	.002300			
15,000	60,000	.020000	.002500			
15,500	62,000	.022500	.002500			
16,000	64,000	.025000	.002500			
16,500	66,000	.0283	.0033			
17,000	68,000	.0317	.0034			
17,500	70,000	.0350	.0033			
18,000	72,000	.0383	.0033			
18,500	74,000	.0450	.0067			
19,000	76,000	.0500	.0050			
19,500	78,000	.0567	.0067			
20,000	80,000	.0667	.0100			
20,500	82,000	.0833	.0166			
20,980	83,920	.1267	.0434			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	83,920
Elastic limit per square inch of original section	do...	43,000
Elongation per inch after rupture	inch..	0.1750
Elongation per inch under strain at elastic limit	do...	.001450
Reduction in diameter at point of rupture	do...	.194
Reduction in area after rupture, per centum of original section		57.0
Position of rupture		1".90 from neck
Character of broken surface		silky
Elongation of inch sections		".13, ".44*, ".15, ".11, ".10, ".12

STEEL SPECIMENS FROM HOOPS

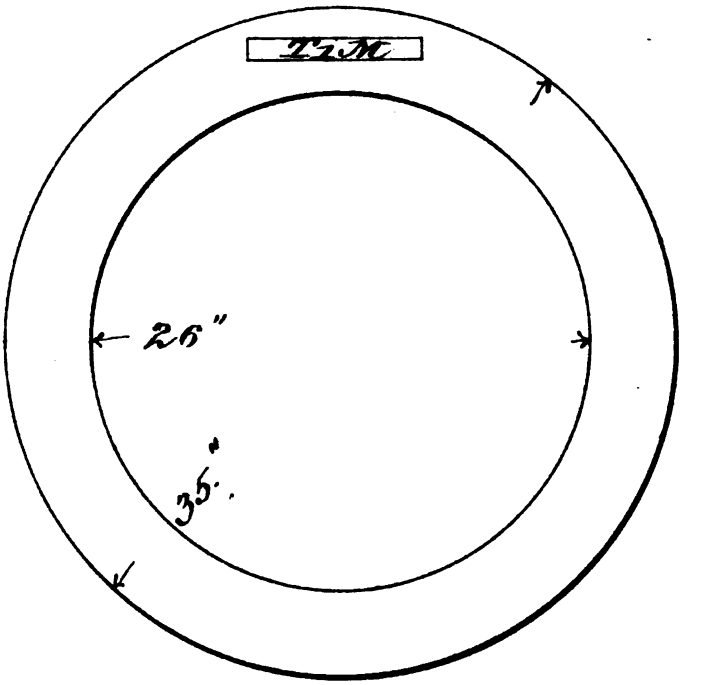
FOR

10-INCH STEEL B. L. RIFLE NO. 1.

1021

10" Steel B.L. Rifle No. 1

Hoop A 4



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STEEL SPECIMENS FROM HOOPS FOR 10-INCH STEEL B. L. RIFLE NO. 1.

No. 2678.

Marks, $^{10}_{T_1}\,R_1\,A_4\,M$
Diameter, ".564.
Sectional area, .25 square inch.

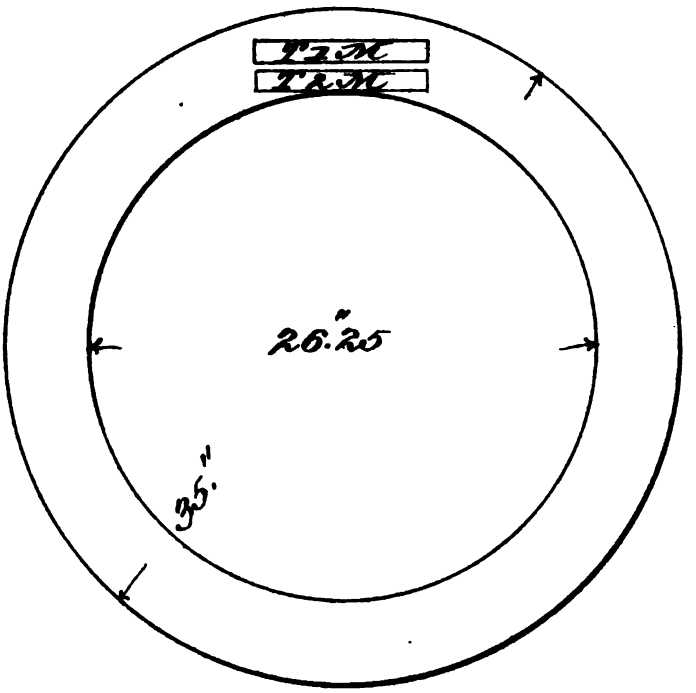
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	.....	
2,500	10,000	.000300	.000133	0.	.....	
3,750	15,000	.000550	.000250	0.	.....	
5,000	20,000	.000717	.000167	0.	.....	
6,250	25,000	.000933	.000216	.000017	.000017	
7,500	30,000	.001133	.000200	.000050	.000030	
8,750	35,000	.001267	.000134	.000050	0.	
10,000	40,000	.001433	.000166	.000067	.000017	
11,250	45,000	.001567	.000134	.....	.....	
12,500	50,000	.001750	.000183	.....	.....	
12,750	51,000	.001800	.000050	.....	.....	
13,000	52,000	.001850	.000050	.....	.....	
13,250	53,000	.001900	.000050	.....	.....	
13,500	54,000	.001933	.000033	.....	.....	
13,750	55,000	.001967	.000034	.....	.....	
14,000	56,000	.002000	.000033	.....	.....	
14,250	57,000	.002033	.000033	.....	.....	
14,500	58,000	.002100	.000067	.....	.....	Elastic limit.
14,750	59,000	.003167	.001067	.....	.....	
15,000	60,000	.005567	.002400	.....	.....	
15,500	62,000	.007333	.001766	.....	.....	
16,000	64,000	.008750	.001417	.....	.....	
16,500	66,000	.010333	.001583	.....	.....	
17,000	68,000	.011833	.001500	.....	.....	
17,500	70,000	.013183	.001350	.....	.....	
18,000	72,000	.014917	.001734	.....	.....	
18,500	74,000	.016683	.001766	.....	.....	
19,000	76,000	.018433	.001750	.....	.....	
19,500	78,000	.020517	.002084	.....	.....	
20,000	80,000	.022500	.001983	.....	.....	
20,500	82,000	.0250	.0025	.....	.....	
21,000	84,000	.0283	.0033	.....	.....	
21,500	86,000	.0300	.0017	.....	.....	
22,000	88,000	.0333	.0033	.....	.....	
22,500	90,000	.0367	.0034	.....	.....	
23,000	92,000	.0383	.0016	.....	.....	
23,500	94,000	.0417	.0034	.....	.....	
24,000	96,000	.0467	.0050	.....	.....	
24,500	98,000	.0517	.0050	.....	.....	
25,000	100,000	.0600	.0083	.....	.....	
25,500	102,000	.0700	.0100	.....	.....	
26,000	104,000	.0867	.0167	.....	.....	
26,060	104,240	.1050	.0183	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	104,240
Elastic limit per square inch of original section	do...	53,000
Elongation per inch after rupture	inch..	0.1400
Elongation per inch under strain at elastic limit	do...	.002100
Reduction in diameter at point of rupture	do...	.134
Reduction in area after rupture, per centum of original section		41.9
Position of rupture		2".80 from neck
Character of broken surface		silky
Elongation of inch sections		".13, ".12, ".32*, ".10, ".09, ".08

10" Steel B. L. Rifle No. 1.

Hoop A5



H Ex 31 49 2

No. 2681.

Marks, $^{10}_{T}\,R_{1}\,A_{s}\,M$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000300	.000183	0.	.....	
3,750	15,000	.000467	.000167	0.	.....	
5,000	20,000	.000617	.000150	0.	.....	
6,250	25,000	.000783	.000166	0.	.....	
7,500	30,000	.000967	.000184	0.	.....	
8,750	35,000	.001133	.000166	0.	.....	
10,000	40,000	.001300	.000167	0.	.....	
11,250	45,000	.001450	.000150	.....	.....	
12,500	50,000	.001667	.000217	.....	.....	
12,750	51,000	.001683	.000016	.....	.....	
13,000	52,000	.001717	.000034	.....	.....	
13,250	53,000	.001750	.000033	.....	.....	
13,500	54,000	.001800	.000050	.....	.....	
13,750	55,000	.001833	.000033	.....	.....	Elastic limit.
14,000	56,000	.006233	.004400	.....	.....	
14,250	57,000	.006733	.000500	.....	.....	
14,500	58,000	.007617	.000884	.....	.....	
14,750	59,000	.008333	.000716	.....	.....	
15,000	60,000	.009267	.000934	.....	.....	
15,500	62,000	.011167	.001900	.....	.....	
16,000	64,000	.012750	.001583	.....	.....	
16,500	66,000	.014667	.001917	.....	.....	
17,000	68,000	.016333	.001666	.....	.....	
17,500	70,000	.018333	.002000	.....	.....	
18,000	72,000	.020500	.002167	.....	.....	
18,500	74,000	.022500	.002000	.....	.....	
19,000	76,000	.025000	.002500	.....	.....	
19,500	78,000	.027500	.002500	.....	.....	
20,000	80,000	.030200	.002700	.....	.....	
20,500	82,000	.0333	.0031	.....	.....	
21,000	84,000	.0358	.0025	.....	.....	
21,500	86,000	.0400	.0042	.....	.....	
22,000	88,000	.0450	.0050	.....	.....	
22,500	90,000	.0500	.0050	.....	.....	
23,000	92,000	.0567	.0067	.....	.....	
23,500	94,000	.0667	.0100	.....	.....	
24,000	96,000	.0800	.0133	.....	.....	
24,460	97,840	.1133	.0333	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	97,840
Elastic limit per square inch of original section	do...	55,000
Elongation per inch after rupture	inch..	0.1667
Elongation per inch under strain at elastic limit	do...	.001833
Reduction in diameter at point of rupture	do...	.164
Reduction in area after rupture, per centum of original section		49.7
Position of rupture		3¼ inches from neck
Character of broken surface		silky
Elongation of inch sections		".07, ".11, ".38*, ".20, ".14, ".10

No. 2777.

Marks, $\frac{10\,R_1\,A_2}{T_2\,I}$
Diameter, ".564.
Sectional area, .25 square inch.

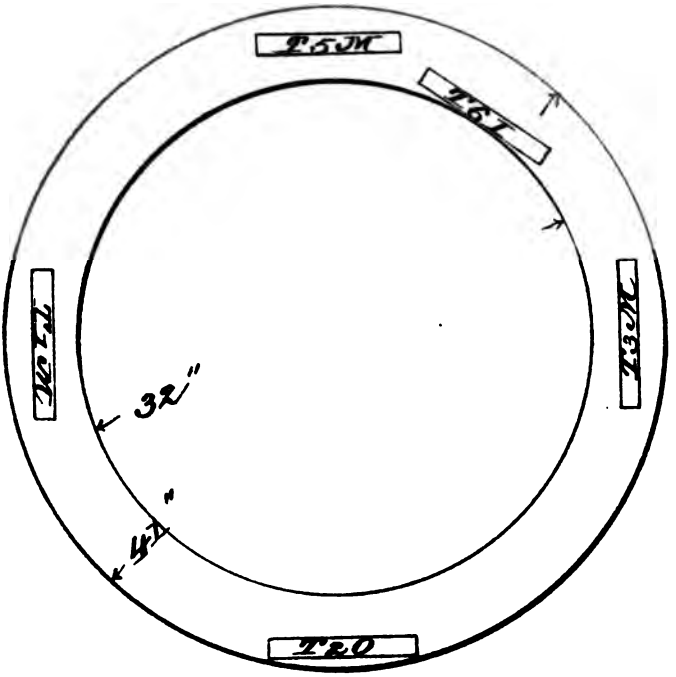
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000267	.000167	0.	.....	
3,750	15,000	.000433	.000166	0.	.....	
5,000	20,000	.000583	.000150	0.	.....	
6,250	25,000	.000750	.000167	0.	.....	
7,500	30,000	.000933	.000183	0.	.....	
8,750	35,000	.001083	.000150	0.	.....	
10,000	40,000	.001233	.000150	0.	.....	
11,250	45,000	.001400	.000167	0.	.....	
12,500	50,000	.001583	.000183	0.	.....	
12,750	51,000	.001617	.000034	.....	.....	
13,000	52,000	.001650	.000033	.....	.....	
13,250	53,000	.001683	.000033	.....	.....	
13,500	54,000	.001717	.000034	.....	.....	
13,750	55,000	.001750	.000033	.....	.....	
14,000	56,000	.001783	.000033	.....	.....	
14,250	57,000	.001817	.000034	.....	.....	
14,500	58,000	.001867	.000050	.....	.....	
14,750	59,000	.001900	.000033	.....	.....	Elastic limit.
15,000	60,000	.002500	.000600	.....	.....	
15,500	62,000	.005833	.003333	.....	.....	
16,000	64,000	.007250	.001417	.....	.....	
16,500	66,000	.009933	.001683	.....	.....	
17,000	68,000	.010450	.001517	.....	.....	
17,500	70,000	.012167	.001717	.....	.....	
18,000	72,000	.013833	.001666	.....	.....	
18,500	74,000	.015700	.001867	.....	.....	
19,000	76,000	.017667	.001967	.....	.....	
19,500	78,000	.019333	.001666	.....	.....	
20,000	80,000	.021333	.002000	.....	.....	
20,500	82,000	.023667	.002334	.....	.....	
21,000	84,000	.026000	.002333	.....	.....	
21,500	86,000	.028367	.002367	.....	.....	
22,000	88,000	.031167	.002800	.....	.....	
22,500	90,000	.0333	.002133	.....	.....	
23,000	92,000	.0367	.0034	.....	.....	
23,500	94,000	.0417	.0050	.....	.....	
24,000	96,000	.0467	.0050	.....	.....	
24,500	98,000	.0533	.0066	.....	.....	
25,000	100,000	.0600	.0067	.....	.....	
25,500	102,000	.0683	.0083	.....	.....	
26,000	104,000	.0883	.0200	.....	.....	
26,190	104,760	.1133	.0250	.....	.....	Tensile strength.

General summary.

Specific gravity		7.8424
Hardness		20.70
Tensile strength per square inch of original section	pounds..	104,760
Elastic limit per square inch of original section	do..	59,000
Elongation per inch after rupture	inch..	0.1517
Elongation per inch under strain at elastic limit	do..	.001900
Reduction in diameter at point of rupture	do..	.164
Reduction in area after rupture, per centum of original section		49.7
Position of rupture		1".40 from neck
Character of broken surface		silky
Elongation of inch sections		".16, ".31*, ".12, ".11, ".11, ".10

10" Steel B. L. Rifle No. 1.

Hoop B 2



H Ex 31 49 2

No. 2602.

Marks, $^{10}_{T,M}R_1B_2$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167			
2,500	10,000	.000333	.000166			
3,750	15,000	.000450	.000117			
5,000	20,000	.000633	.000183	.000017	.000017	
6,250	25,000	.000800	.000167	.000017	0.	
7,500	30,000	.000983	.000183	.000017	0.	
8,750	35,000	.001150	.000167	.000017	0.	
10,000	40,000	.001300	.000150	.000017	0.	
11,250	45,000	.001467	.000167	.000017	0.	
12,500	50,000	.001617	.000150			
12,750	51,000	.001650	.000033			
13,000	52,000	.001683	.000033			
13,250	53,000	.001717	.000034			
13,500	54,000	.001733	.000016			
13,750	55,000	.001783	.000050	.000017	0.	
14,000	56,000	.001817	.000034			
14,250	57,000	.001850	.000033			
14,500	58,000	.001883	.000033			
14,750	59,000	.001933	.000050			
15,000	60,000	.001983	.000050	.000033	.000016	
15,250	61,000	.002017	.000034			
15,500	62,000	.002050	.000033			Elastic limit.
15,750	63,000	.010350	.008300			
16,000	64,000	.010683	.000333			
16,500	66,000	.012333	.001650			
17,000	68,000	.014000	.001667			
17,500	70,000	.015283	.001283			
18,000	72,000	.016417	.001134			
18,500	74,000	.018083	.001666			
19,000	76,000	.020000	.001917			
19,500	78,000	.021833	.001833			
20,000	80,000	.023917	.002084			
20,500	82,000	.025833	.001916			
21,000	84,000	.028083	.002250			
21,500	86,000	.030417	.002334			
22,000	88,000	.0333	.002883			
22,500	90,000	.0367	.0034			
23,000	92,000	.0400	.0033			
23,500	94,000	.0450	.0050			
24,000	96,000	.0500	.0050			
24,500	98,000	.0550	.0050			
25,000	100,000	.0616	.0067			
25,500	102,000	.0683	.0066			
26,000	104,000	.0817	.0134			
26,500	106,000	.1067	.0250			
26,570	106,280	.1283	.0216			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	106,280
Elastic limit per square inch of original section	do...	62,000
Elongation per inch after rupture	inch..	0.1600
Elongation per inch under strain at elastic limit	do...	.002050
Reduction in diameter at point of rupture	do...	.134
Reduction in area after rupture, per centum of original section		41.9
Position of rupture		2 inches from neck
Character of broken surface		silky
Elongation of inch sections		".10, ".11, ".12, ".16, ".33*, ".14

No. 2603.

Marks, $^{10}_{T_7}\,^{R_1\,B_2}_{O}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000250	.000150	0.	.....	
3,750	15,000	.000417	.000167	0.	.....	
5,000	20,000	.000583	.000166	0.	.....	
6,250	25,000	.000767	.000184	0.	.....	
7,500	30,000	.000933	.000166	0.	.....	
8,750	35,000	.001100	.000167	0.	.....	
10,000	40,000	.001250	.000150	0.	.....	
11,250	45,000	.001400	.000150	0.	.....	
12,500	50,000	.001567	.000167	0.	.....	
12,750	51,000	.001600	.000033	.....	.....	
13,000	52,000	.001633	.000033	.....	.....	
13,250	53,000	.001683	.000050	.....	.....	
13,500	54,000	.001750	.000067	.....	.....	
13,750	55,000	.001783	.000034	.....	.....	
14,000	56,000	.001817	.000034	.....	.....	
14,250	57,000	.001833	.000016	.....	.....	
14,500	58,000	.001867	.000034	.....	.....	
14,750	59,000	.001900	.000033	.....	.....	
15,000	60,000	.001933	.000033	.....	.....	
15,250	61,000	.001950	.000017	.....	.....	
15,500	62,000	.002000	.000050	.....	.....	
15,750	63,000	.002033	.000033	.....	.....	
16,000	64,000	.002067	.000034	.....	.....	
16,250	65,000	.002100	.000033	.....	.....	
16,500	66,000	.002150	.000050	.....	.....	Elastic limit.
16,750	67,000	.004917	.002767	.....	.....	
17,000	68,000	.007533	.002616	.....	.....	
17,500	70,000	.008333	.000800	.....	.....	
18,000	72,000	.009833	.001500	.....	.....	
18,500	74,000	.011117	.001284	.....	.....	
19,000	76,000	.012500	.001383	.....	.....	
19,500	78,000	.013700	.001200	.....	.....	
20,000	80,000	.015333	.001633	.....	.....	
20,500	82,000	.016833	.001500	.....	.....	
21,000	84,000	.018333	.001500	.....	.....	
21,500	86,000	.020000	.001667	.....	.....	
22,000	88,000	.021833	.001833	.....	.....	
22,500	90,000	.023800	.001967	.....	.....	
23,000	92,000	.025667	.001867	.....	.....	
23,500	94,000	.028083	.002416	.....	.....	
24,000	96,000	.030000	.001917	.....	.....	
24,500	98,000	.0333	.0033	.....	.....	
25,000	100,000	.0367	.0034	.....	.....	
25,500	102,000	.0400	.0033	.....	.....	
26,000	104,000	.0433	.0033	.....	.....	
26,500	106,000	.0467	.0034	.....	.....	
27,000	108,000	.0517	.0050	.....	.....	
27,500	110,000	.0567	.0050	.....	.....	
28,000	112,000	.0667	.0100	.....	.....	
28,500	114,000	.0817	.0150	.....	.....	
28,790	115,160	.1117	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	115,160
Elastic limit per square inch of original section	do...	66,000
Elongation per inch after rupture	inch..	0.1383
Elongation per inch under strain at elastic limit	do...	.002150
Reduction in diameter at point of rupture	do...	.104
Reduction in area after rupture, per centum of original section		33.5
Position of rupture		".05 from middle of stem
Character of broken surface		silky; interspersed with fine granulation
Elongation of inch sections		".08, ".09, ".22*, ".20, ".14, ".10

No. 2604.

Marks, $^{10}_{T_2}\mathrm{R_1\,B_2}$
Diameter, ″.565.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000283	.000166	0.	.....	
3,750	15,000	.000450	.000167	0.	.....	
5,000	20,000	.000617	.000167	0.	.....	
6,250	25,000	.000767	.000150	0.	.....	
7,500	30,000	.000933	.000166	0.	.....	
8,750	35,000	.001083	.000150	0.	.....	
10,000	40,000	.001233	.000150	0.	.....	
11,250	45,000	.001400	.000167	0.	.....	
12,500	50,000	.001567	.000167	0.	.....	
13,750	55,000	.001733	.000166	.....	.....	
14,000	56,000	.001767	.000034	.....	.....	
14,250	57,000	.001800	.000033	.....	.....	
14,500	58,000	.001867	.000067	.....	.....	
14,750	59,000	.001883	.000016	.....	.....	
15,000	60,000	.001917	.000034	.....	.....	
15,250	61,000	.001933	.000016	.....	.....	
15,500	62,000	.001967	.000034	.....	.....	
15,750	63,000	.002000	.000033	.....	.....	
16,000	64,000	.002067	.000067	.....	.....	
16,250	65,000	.002100	.000033	.....	.....	Elastic limit.
16,500	66,000	.004750	.002650	.....	.....	
17,000	68,000	.009167	.004417	.....	.....	
17,500	70,000	.010200	.001033	.....	.....	
18,000	72,000	.011500	.001300	.....	.....	
18,500	74,000	.012833	.001333	.....	.....	
19,000	76,000	.014333	.001500	.....	.....	
19,500	78,000	.015833	.001500	.....	.....	
20,000	80,000	.017333	.001500	.....	.....	
20,500	82,000	.019000	.001667	.....	.....	
21,000	84,000	.020750	.001750	.....	.....	
21,500	86,000	.022333	.001583	.....	.....	
22,000	88,000	.024167	.001834	.....	.....	
22,500	90,000	.026000	.001833	.....	.....	
23,000	92,000	.028083	.002083	.....	.....	
23,500	94,000	.030667	.002584	.....	.....	
24,000	96,000	.0338	.002633	.....	.....	
24,500	98,000	.0367	.0034	.....	.....	
25,000	100,000	.0383	.0016	.....	.....	
25,500	102,000	.0417	.0034	.....	.....	
26,000	104,000	.0467	.0050	.....	.....	
26,500	106,000	.0533	.0066	.....	.....	
27,000	108,000	.0600	.0067	.....	.....	
27,500	110,000	.0700	.0100	.....	.....	
28,000	112,000	.0800	.0100	.....	.....	
28,420	113,680	.1233	.0433	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	113,680
Elastic limit per square inch of original section	do...	65,000
Elongation per inch after rupture	inch..	0.1467
Elongation per inch under strain at elastic limit	do...	.002100
Reduction in diameter at point of rupture	do...	.085
Reduction in area after rupture, per centum of original section		27.6
Position of rupture		1″.90 from neck
Character of broken surface		silky center; fine granular at circumference
Elongation of inch sections		″.12, ″.28*, ″.15, ″.13, ″.12, ″.08

No. 2743.

Marks, $^{10}_{T_5}\,R_1B_2M$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000300	.000183	0.	.....	
3,750	15,000	.000433	.000133	0.	.....	
5,000	20,000	.000633	.000200	0.	.....	
6,250	25,000	.000800	.000167	0.	.....	
7,500	30,000	.000983	.000183	0.	.....	
8,750	35,000	.001133	.000150	0.	.....	
10,000	40,000	.001317	.000184	0.	.....	
11,250	45,000	.001467	.000150	.....	.....	
11,500	46,000	.001500	.000033	.....	.....	
11,750	47,000	.001533	.000033	.....	.....	
12,000	48,000	.001567	.000034	.....	.....	
12,250	49,000	.001617	.000050	.....	.....	
12,500	50,000	.001667	.000050	.....	.....	
12,750	51,000	.001683	.000016	.....	.....	
13,000	52,000	.001717	.000034	.....	.....	
13,250	53,000	.001750	.000033	.....	.....	
13,500	54,000	.001783	.000033	.....	.....	
13,750	55,000	.001817	.000034	.....	.....	
14,000	56,000	.001867	.000050	.....	.....	
14,250	57,000	.001883	.000016	.....	.....	
14,500	58,000	.001950	.000067	.....	.....	
14,750	59,000	.001983	.000033	.....	.....	
15,000	60,000	.002017	.000034	.....	.....	
15,250	61,000	.002050	.000033	.....	.....	Elastic limit.
15,500	62,000	.006000	.003950	.....	.....	
16,000	64,000	.010333	.004333	.....	.....	
16,500	66,000	.011017	.000684	.....	.....	
17,000	68,000	.012500	.001483	.....	.....	
17,500	70,000	.013833	.001333	.....	.....	
18,000	72,000	.015333	.001500	.....	.....	
18,500	74,000	.017000	.001667	.....	.....	
19,000	76,000	.018500	.001500	.....	.....	
19,500	78,000	.020000	.001500	.....	.....	
20,000	80,000	.022000	.002000	.....	.....	
20,500	82,000	.023833	.001833	.....	.....	
21,000	84,000	.025833	.002000	.....	.....	
21,500	86,000	.0283	.002467	.....	.....	
22,000	88,000	.0317	.0034	.....	.....	
22,500	90,000	.0333	.0016	.....	.....	
23,000	92,000	.0350	.0017	.....	.....	
23,500	94,000	.0383	.0033	.....	.....	
24,000	96,000	.0417	.0034	.....	.....	
24,500	98,000	.0467	.0050	.....	.....	
25,000	100,000	.0517	.0050	.....	.....	
25,500	102,000	.0567	.0050	.....	.....	
26,000	104,000	.0667	.0100	.....	.....	
26,500	106,000	.0767	.0100	.....	.....	
27,000	108,000	.0950	.0183	.....	.....	
27,160	108,640	.1183	.0233	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	108,640
Elastic limit per square inch of original section	do...	61,000
Elongation per inch after rupture	inch..	0.1500
Elongation per inch under strain at elastic limit	do...	.002050
Reduction in diameter at point of rupture	do...	.134
Reduction in area after rupture, per centum of original section		41.9
Position of rupture		1″.20 from neck
Character of broken surface		fine silky
Elongation of inch sections		″.20*, ″.26*, ″.14, ″.11, ″.10, ″.09

No. 2744.

Marks, $\frac{10\,R_1\,B_2}{T_5\,I}$
Diameter, ".564.
Sectional area, .25 square inch.

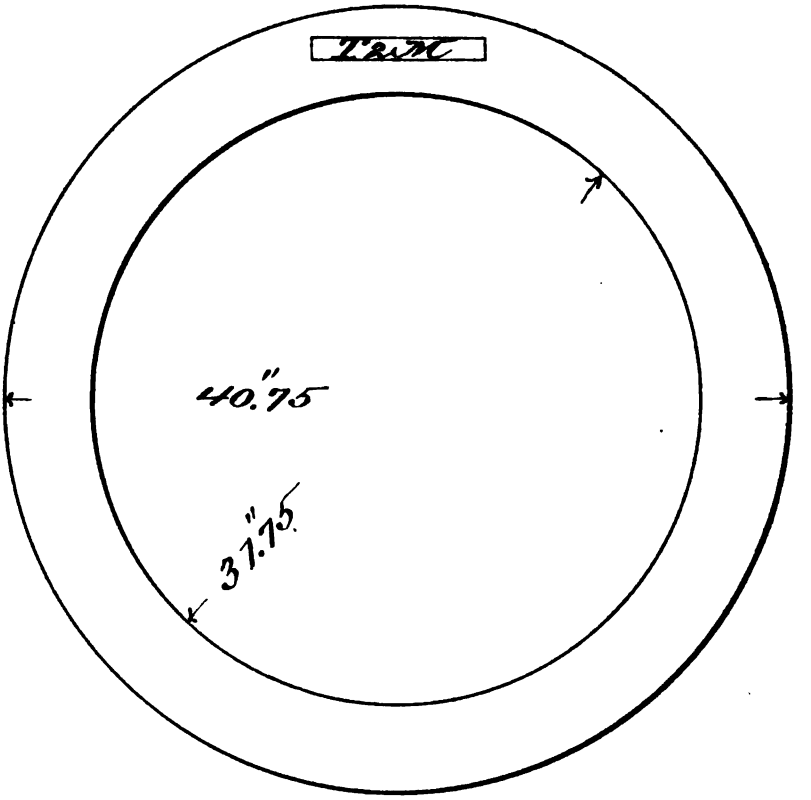
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000317	.000184	0.	.....	
3,750	15,000	.000467	.000150	0	.....	
5,000	20,000	.000633	.000166	0.	.....	
6,250	25,000	.000800	.000167	0.	.....	
7,500	30,000	.000967	.000167	0.	.....	
8,750	35,000	.001133	.000166	0.	.....	
10,000	40,000	.001333	.000200	0.	.....	
11,250	45,000	.001483	.000150	0.	.....	
12,500	50,000	.001667	.000184	0.	.....	
12,750	51,000	.001700	.000033	.....	.....	
13,000	52,000	.001733	.000033	.....	.....	
13,250	53,000	.001767	.000034	.....	.....	
13,500	54,000	.001800	.000033	.....	.....	
13,750	55,000	.001833	.000033	.....	.....	
14,000	56,000	.001867	.000034	.....	.....	
14,250	57,000	.001883	.000016	.....	.....	
14,500	58,000	.001933	.000050	.....	.....	
14,750	59,000	.001967	.000034	.....	.....	
15,000	60,000	.002017	.000050	.....	.....	
15,250	61,000	.002033	.000016	.....	.....	
15,500	62,000	.002083	.000050	.....	.....	
15,750	63,000	.002117	.000034	.....	.....	
16,000	64,000	.002167	.000050	.....	.....	
16,250	65,000	.002200	.000033	.....	.....	Elastic limit.
16,500	66,000	.002500	.000300	.....	.....	
16,750	67,000	.002683	.000183	.....	.....	
17,000	68,000	.005200	.002517	.....	.....	
17,500	70,000	.007033	.001833	.....	.....	
18,000	72,000	.008667	.001634	.....	.....	
18,500	74,000	.010750	.002083	.....	.....	
19,000	76,000	.012333	.001583	.....	.....	
19,500	78,000	.013667	.001334	.....	.....	
20,000	80,000	.015000	.001333	.....	.....	
20,500	82,000	.016667	.001667	.....	.....	
21,000	84,000	.018333	.001666	.....	.....	
21,500	86,000	.020000	.001667	.....	.....	
22,000	88,000	.021833	.001833	.....	.....	
22,500	90,000	.024167	.002334	.....	.....	
23,000	92,000	.026000	.001833	.....	.....	
23,500	94,000	.028000	.002000	.....	.....	
24,000	96,000	.0300	.0020	.....	.....	
24,500	98,000	.0333	.0033	.....	.....	
25,000	100,000	.0367	.0034	.....	.....	
25,500	102,000	.0383	.0016	.....	.....	
26,000	104,000	.0433	.0050	.....	.....	
26,500	106,000	.0483	.0050	.....	.....	
27,000	108,000	.0517	.0034	.....	.....	
27,500	110,000	.0600	.0083	.....	.....	
28,000	112,000	.0717	.0117	.....	.....	
28,480	113,920	.0917	.0200	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	113,920
Elastic limit per square inch of original section	do...	65,000
Elongation per inch after rupture	inch..	0.1150
Elongation per inch under strain at elastic limit	do...	.002200
Reduction in diameter at point of rupture	do...	.114
Reduction in area after rupture, per centum of original section		36.4
Position of rupture		".95 from neck; oblique
Character of broken surface		silky; traces of granulation
Elongation of inch sections		".26", ".13, ".07, ".06, ".08, ".09

10" Steel B.L. Rifle No.1.

Hoop B3



H Ex 31 492

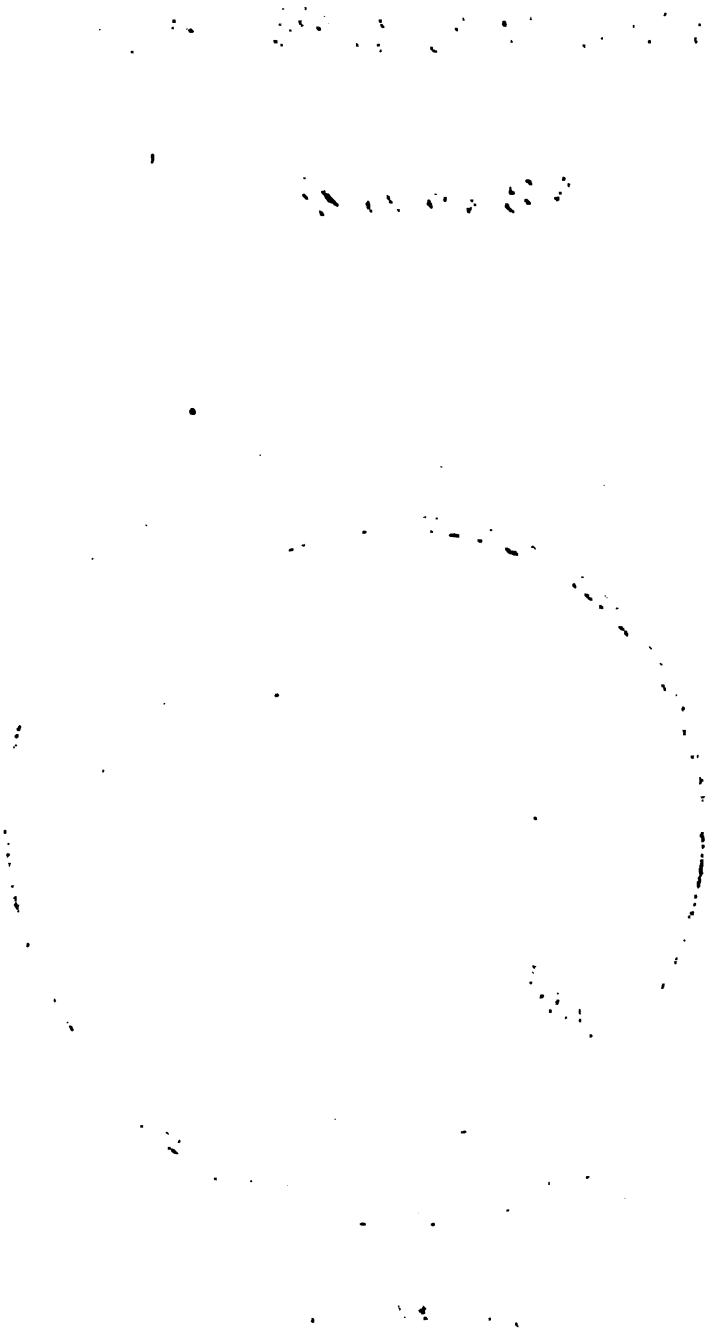
No. 2775.

Marks, $10\frac{R_1 B_2}{T_1 M}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000267	.000167	0.	.....	
3,750	15,000	.000433	.000166	0.	.....	
5,000	20,000	.000583	.000150	0.	.....	
6,250	25,000	.000750	.000167	0.	.....	
7,500	30,000	.000917	.000167	0.	.....	
8,750	35,000	.001083	.000166	0.	.....	
10,000	40,000	.001233	.000150	−.000033	−.000033	
11,250	45,000	.001400	.000167	.....	.....	
12,500	50,000	.001567	.000167	.....	.....	
12,750	51,000	.001600	.000033	.....	.....	
13,000	52,000	.001650	.000050	.....	.....	
13,250	53,000	.001683	.000033	.....	.....	Elastic limit.
13,500	54,000	.002367	.000684	.....	.....	
13,750	55,000	.004283	.001916	.....	.....	
14,000	56,000	.006000	.001717	.....	.....	
14,250	57,000	.007500	.001500	.....	.....	
14,500	58,000	.008000	.000500	.....	.....	
14,750	59,000	.008583	.000583	.....	.....	
15,000	60,000	.009417	.000834	.....	.....	
15,500	62,000	.011133	.001716	.....	.....	
16,000	64,000	.012783	.001650	.....	.....	
16,500	66,000	.014500	.001717	.....	.....	
17,000	68,000	.016333	.001833	.....	.....	
17,500	70,000	.018167	.001834	.....	.....	
18,000	72,000	.020200	.002033	.....	.....	
18,500	74,000	.022500	.002300	.....	.....	
19,000	76,000	.024417	.001917	.....	.....	
19,500	78,000	.026667	.002250	.....	.....	
20,000	80,000	.0300	.003333	.....	.....	
20,500	82,000	.0333	.0033	.....	.....	
21,000	84,000	.0350	.0017	.....	.....	
21,500	86,000	.0383	.0033	.....	.....	
22,000	88,000	.0450	.0067	.....	.....	
22,500	90,000	.0500	.0050	.....	.....	
23,000	92,000	.0550	.0050	.....	.....	
23,500	94,000	.0667	.0117	.....	.....	
24,000	96,000	.0800	.0133	.....	.....	
24,500	98,000	.1067	.0267	.....	.....	
24,580	98,320	.1200	.0133	.....	.....	Tensile strength.

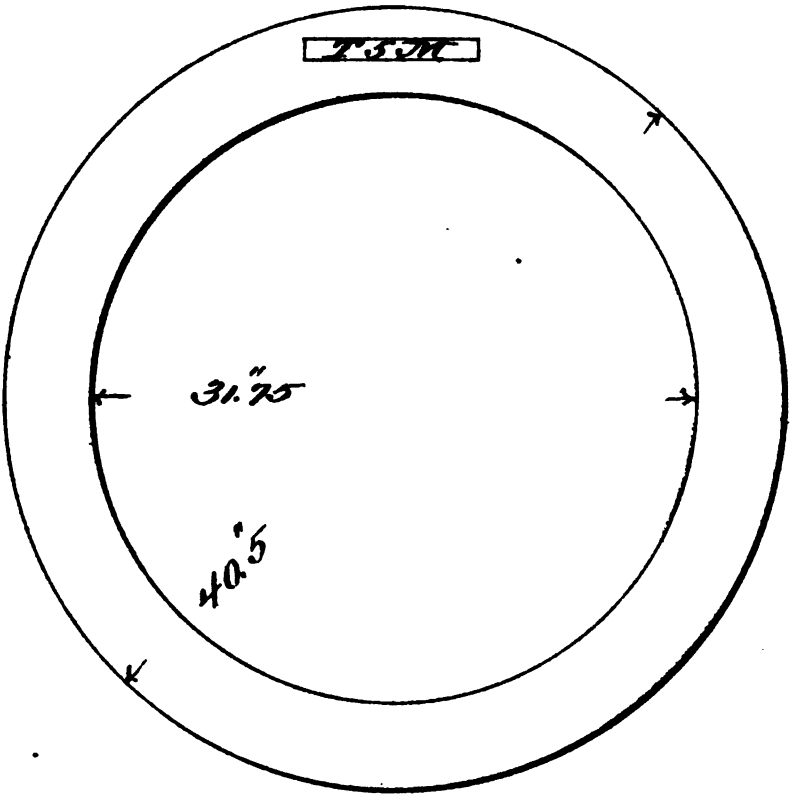
General summary.

Tensile strength per square inch of original section	pounds..	98,320
Elastic limit per square inch of original section	do ..	53,000
Elongation per inch after rupture	inch..	0.1817
Elongation per inch under strain at elastic limit	do...	.001683
Reduction in diameter at point of rupture	do...	.154
Reduction in area after rupture, per centum of original section		47.2
Position of rupture		1".23 from neck
Character of broken surface		silky
Elongation of inch sections		".10, ".13, ".15, ".16, ".32*, ".23*



10" Steel B. L. Rifle No. 1.

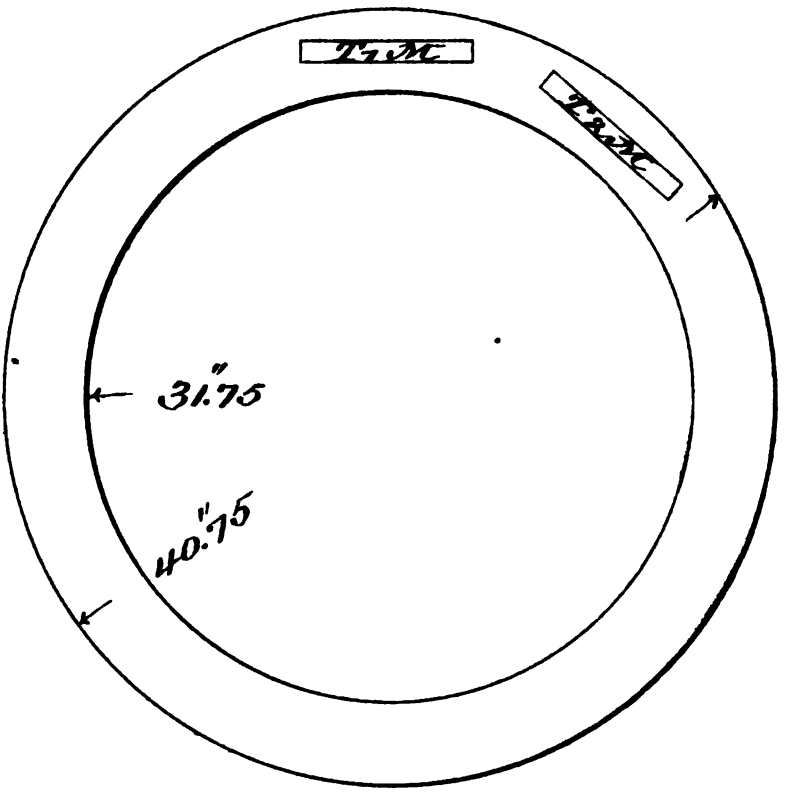
Hoop B 4



H Ex 31 49 2

10" Steel B.L. Rifle No. 1

Hoop B5



H Ex 31 49 2

No. 2679.

Marks, $^{10}_{T,M}{}^{R_1}_{}{}^{Bs}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000267	.000167	0.	.....	
3,750	15,000	.000450	.000183	0.	.....	
5,000	20,000	.000600	.000150	0.	.....	
6,250	25,000	.000767	.000167	0.	.....	
7,500	30,000	.000933	.000166	0.	.....	
8,750	35,000	.001100	.000167	0.	.....	
10,000	40,000	.001267	.000167	0.	.....	
11,250	45,000	.001433	.000166	.....	.....	
12,500	50,000	.001633	.000200	.....	.....	
12,750	51,000	.001683	.000050	.....	.....	
13,000	52,000	.001733	.000050	.....	.....	
13,250	53,000	.001750	.000017	.....	.....	
13,500	54,000	.001800	.000050	.....	.....	Elastic limit.
12,750	55,000	.001900	.000100	.....	.....	
14,000	56,000	.002333	.000433	.....	.....	
14,250	57,000	.002833	.000500	.....	.....	
14,500	58,000	.003833	.001000	.....	.....	
14,750	59,000	.006333	.002500	.....	.....	
15,000	60,000	.007417	.001084	.....	.....	
15,500	62,000	.008383	.000966	.....	.....	
16,000	64,000	.010000	.001617	.....	.....	
16,500	66,000	.011667	.001667	.....	.....	
17,000	68,000	.013333	.001666	.....	.....	
17,500	70,000	.015033	.001700	.....	.....	
18,000	72,000	.016833	.001800	.....	.....	
18,500	74,000	.018917	.002084	.....	.....	
19,000	76,000	.021000	.002083	.....	.....	
19,500	78,000	.023000	.002000	.....	.....	
20,000	80,000	.0250	.0020	.....	.....	
20,500	82,000	.0283	.0033	.....	.....	
21,000	84,000	.0317	.0034	.....	.....	
21,500	86,000	.0350	.0033	.....	.....	
22,000	88,000	.0367	.0017	.....	.....	
22,500	90,000	.0383	.0016	.....	.....	
23,000	92,000	.0450	.0067	.....	.....	
23,500	94,000	.0500	.0050	.....	.....	
24,000	96,000	.0550	.0050	.....	.....	
24,500	98,000	.0633	.0083	.....	.....	
25,000	100,000	.0767	.0134	.....	.....	
25,500	102,000	{ .1050 { .1250	.0283 .0200	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	102,000
Elastic limit per square inch of original section	do...	54,000
Elongation per inch after rupture	inch..	0.1583
Elongation per inch under strain at elastic limit	do...	.001800
Reduction in diameter at point of rupture	do...	.144
Reduction in area after rupture, per centum of original section		44.6
Position of rupture		".65 from neck
Character of broken surface		silky
Elongation of inch sections		".12, ".12, ".11, ".13, ".12, ".33"

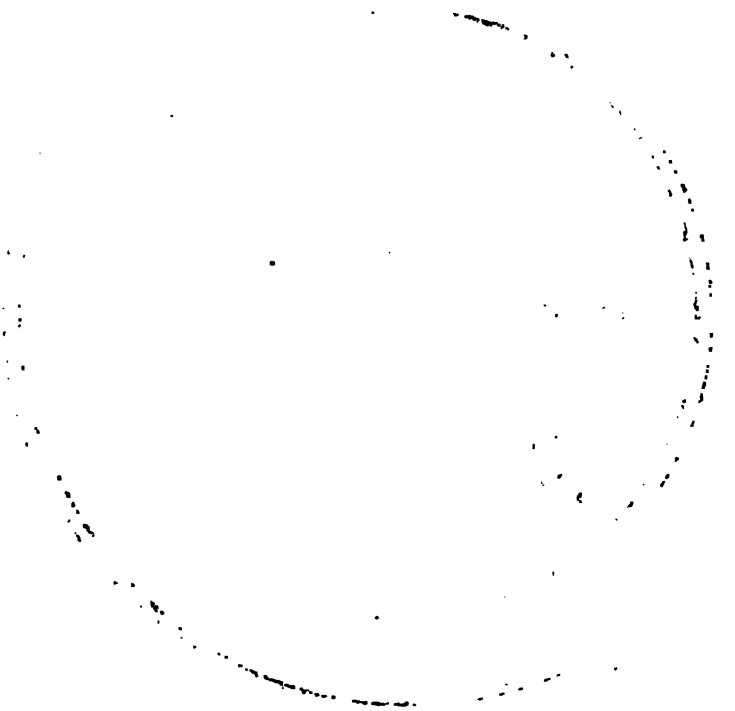
No. 2695.

Marks, $\frac{10\ R_1\ B_8}{T_2\ M}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000300	.000167	0.	.....	
3,750	15,000	.000483	.000183	0.	.....	
5,000	20,000	.000667	.000184	0.	.....	
6,250	25,000	.000833	.000166	0.	.....	
7,500	30,000	.001017	.000184	.000017	.000017	
8,750	35,000	.001183	.000166	.000017	0.	
10,000	40,000	.001350	.000167	.000017	0.	
11,250	45,000	.001500	.000150	.....	.....	
12,500	50,000	.001683	.000183	.....	.....	
12,750	51,000	.001717	.000034	.....	.....	
13,000	52,000	.001733	.000016	.....	.....	
13,250	53,000	.001767	.000034	.....	.....	
13,500	54,000	.001817	.000050	.....	.....	
13,750	55,000	.001867	.000050	.....	.....	
14,000	56,000	.001883	.000016	.....	.....	
14,250	57,000	.001950	.000067	.....	.....	Elastic limit.
14,500	58,000	.002033	.000083	.....	.....	
14,750	59,000	.002317	.000284	.....	.....	
15,000	60,000	.003533	.001216	.....	.....	
15,500	62,000	.004917	.001384	.....	.....	
16,000	64,000	.006500	.001583	.....	.....	
16,500	66,000	.008167	.001667	.....	.....	
17,000	68,000	.009667	.001500	.....	.....	
17,500	70,000	.011500	.001833	.....	.....	
18,000	72,000	.013017	.001517	.....	.....	
18,500	74,000	.014867	.001850	.....	.....	
19,000	76,000	.016500	.001633	.....	.....	
19,500	78,000	.018117	.001617	.....	.....	
20,000	80,000	.020000	.001883	.....	.....	
20,500	82,000	.022000	.002000	.....	.....	
21,000	84,000	.024000	.002000	.....	.....	
21,500	86,000	.026500	.002500	.....	.....	
22,000	88,000	.029167	.002667	.....	.....	
22,500	90,000	.0317	.002533	.....	.....	
23,000	92,000	.0350	.0033	.....	.....	
23,500	94,000	.0383	.0033	.....	.....	
24,000	96,000	.0417	.0034	.....	.....	
24,500	98,000	.0467	.0050	.....	.....	
25,000	100,000	.0517	.0050	.....	.....	
25,500	102,000	.0567	.0050	.....	.....	
26,000	104,000	.0667	.0100	.....	.....	
26,500	106,000	.0850	.0183	.....	.....	
26,610	106,440	.1033	.0183	.....	.....	Tensile strength.

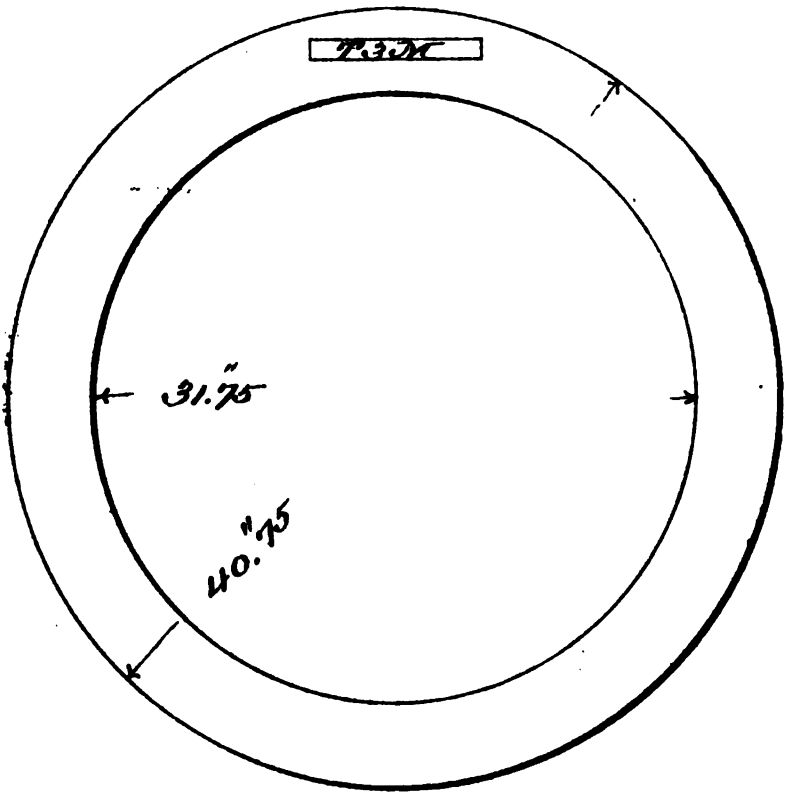
General summary.

Specific gravity		7.8888
Hardness		24.26
Tensile strength per square inch of original section	pounds	106,440
Elastic limit per square inch of original section	do	57,000
Elongation per inch after rupture	inch	0.1267
Elongation per inch under strain at elastic limit	do	.001950
Reduction in diameter at point of rupture	do	.124
Reduction in area after rupture, per centum of original section		39.2
Position of rupture		".15 from middle of stem
Character of broken surface		silky
Elongation of inch sections		".10, ".11, ".14, ".28*, ".08, ".05



10" Steel B. L. Rifle No. 1

Hoop B 6



H Ex 31 49 2

No. 2745.

Marks, $^{10\,R_1\,B_8}_{T_3\,M}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000300	.000167	0.	.....	
3,750	15,000	.000467	.000167	0.	.....	
5,000	20,000	.000650	.000183	0.	.....	
6,250	25,000	.000817	.000167	0.	.....	
7,500	30,000	.000983	.000166	0.	.....	
8,750	35,000	.001167	.000184	0.	.....	
10,000	40,000	.001333	.000166	0.	.....	
11,250	45,000	.001500	.000167	0.	.....	
12,500	50,000	.001667	.000167	0.	.....	
12,750	51,000	.001700	.000033	.....	.....	
13,000	52,000	.001733	.000033	.....	.....	
13,250	53,000	.001750	.000017	.....	.....	
13,500	54,000	.001783	.000033	.....	.....	
13,750	55,000	.001817	.000034	.....	.....	
14,000	56,000	.001850	.000033	.....	.....	
14,250	57,000	.001883	.000033	.....	.....	Elastic limit.
14,500	58,000	.010000	.008117	.....	.....	
14,750	59,000	.010317	.000317	.....	.....	
15,000	60,000	.011050	.000733	.....	.....	
15,500	62,000	.012583	.001533	.....	.....	
16,000	64,000	.014250	.001667	.....	.....	
16,500	66,000	.016083	.001833	.....	.....	
17,000	68,000	.017833	.001750	.....	.....	
17,500	70,000	.020000	.002167	.....	.....	
18,000	72,000	.022333	.002333	.....	.....	
18,500	74,000	.024500	.002167	.....	.....	
19,000	76,000	.026667	.002167	.....	.....	
19,500	78,000	.029083	.002416	.....	.....	
20,000	80,000	.0317	.002617	.....	.....	
20,500	82,000	.0350	.0033	.....	.....	
21,000	84,000	.0367	.0017	.....	.....	
21,500	86,000	.0417	.0050	.....	.....	
22,000	88,000	.0483	.0066	.....	.....	
22,500	90,000	.0533	.0050	.....	.....	
23,000	92,000	.0600	.0067	.....	.....	
23,500	94,000	.0683	.0083	.....	.....	
24,000	96,000	.0833	.0150	.....	.....	
24,500	98,000	.1067	.0234	.....	.....	
24,580	98,320	.1350	.0283	.....	.....	Tensile strength.

General summary.

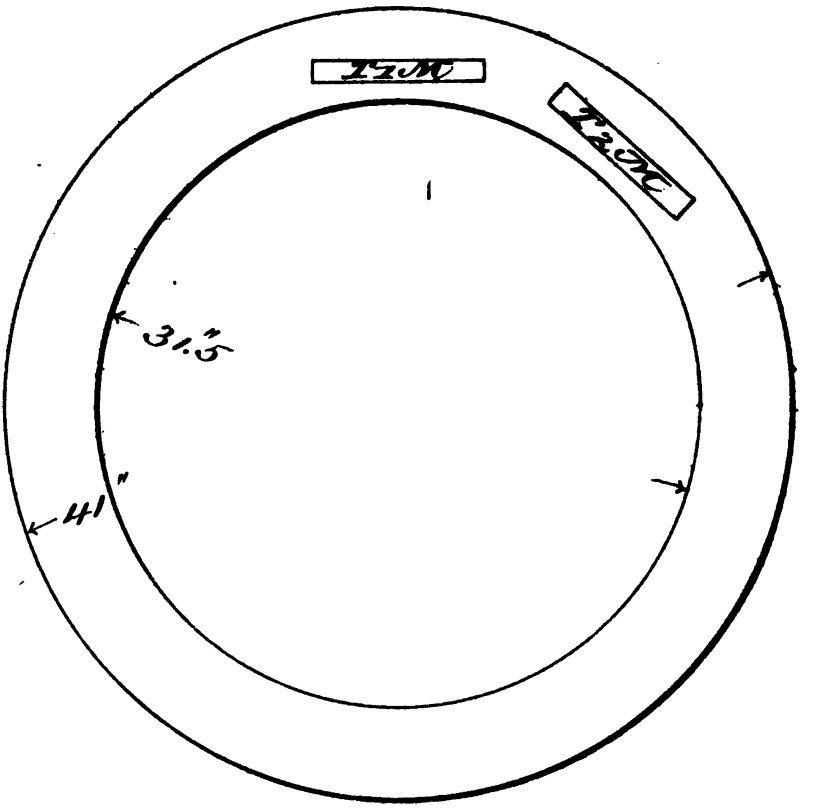
Tensile strength per square inch of original section	pounds..	98,320
Elastic limit per square inch of original section	do...	57,000
Elongation per inch after rupture	inch..	0.1450
Elongation per inch under strain at elastic limit	do...	.001883
Reduction in diameter at point of rupture	do...	.084
Reduction in area after rupture, per centum of original section		27.6
Position of rupture		1″.50 from neck

Character of broken surface, granular, 50 per centum; silky, 50 per centum; opened fine cracks in surface of stem.

Elongation of inch sections ..... ″.09, ″.11, ″.14, ″.16, ″.22*, ″.15

10" Steel B.L. Rifle No. 1

Hoop B7



H Ex 31 492

No. 2615.

Marks, $^{10\,B_1\,B_7}_{T_1\,M}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000083	.000083	0.	.....	
2,500	10,000	.000250	.000167	0.	.....	
3,750	15,000	.000417	.000167	0.	.....	
5,000	20,000	.000583	.000166	0.	.....	
6,250	25,000	.000733	.000150	0.	.....	
7,500	30,000	.000900	.000167	0.	.....	
8,750	35,000	.001067	.000167	0.	.....	
10,000	40,000	.001250	.000183	0.	.....	
11,250	45,000	.001417	.000167	.....	.....	
12,500	50,000	.001600	.000183	.....	.....	
12,750	51,000	.001633	.000033	.....	.....	
13,000	52,000	.001683	.000050	.....	.....	
13,250	53,000	.001717	.000034	.....	.....	
13,500	54,000	.001750	.000033	.....	.....	
13,750	55,000	.001783	.000033	.....	.....	
14,000	56,000	.001817	.000034	.....	.....	
14,250	57,000	.001850	.000033	.....	.....	
14,500	58,000	.001883	.000033	.....	.....	
14,750	59,000	.001917	.000034	.....	.....	
15,000	60,000	.001967	.000050	.....	.....	
15,250	61,000	.002000	.000033	.....	.....	
15,500	62,000	.002033	.000033	.....	.....	
15,750	63,000	.002083	.000050	.....	.....	Elastic limit.
16,000	64,000	.010167	.008084	.....	.....	
16,250	65,000	.010667	.000500	.....	.....	
16,500	66,000	.010917	.000250	.....	.....	
17,000	68,000	.012167	.001250	.....	.....	
17,500	70,000	.013667	.001500	.....	.....	
18,000	72,000	.015333	.001666	.....	.....	
18,500	74,000	.017000	.001667	.....	.....	
19,000	76,000	.018750	.001750	.....	.....	
19,500	78,000	.021083	.002333	.....	.....	
20,000	80,000	.0217	.000617	.....	.....	
20,500	82,000	.0233	.0016	.....	.....	
21,000	84,000	.0267	.0034	.....	.....	
21,500	86,000	.0300	.0033	.....	.....	
22,000	88,000	.0333	.0033	.....	.....	
22,500	90,000	.0367	.0034	.....	.....	
23,000	92,000	.0400	.0033	.....	.....	
23,500	94,000	.0433	.0033	.....	.....	
24,000	96,000	.0467	.0034	.....	.....	
24,500	98,000	.0500	.0033	.....	.....	
25,000	100,000	.0550	.0050	.....	.....	
25,500	102,000	.0667	.0117	.....	.....	
26,000	104,000	.0733	.0066	.....	.....	
26,500	106,000	.0833	.0100	.....	.....	
26,800	107,200	.1350	.0517	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	107,200
Elastic limit per square inch of original section	do...	63,000
Elongation per inch after rupture	inch..	0.1783
Elongation per inch under strain at elastic limit	do...	.002083
Reduction in diameter at point of rupture	do...	.134
Reduction in area after rupture, per centum of original section		41.9
Position of rupture		2″.05 from neck
Character of broken surface		silky
Elongation of inch sections		″.12, ″.36*, ″.21, ″.15, ″.12, ″.19

No. 2822.

Marks, $\frac{10\ R_1\ B_7}{T_2\ M}$
Diameter, ".564.
Sectional area, .25 square inch.

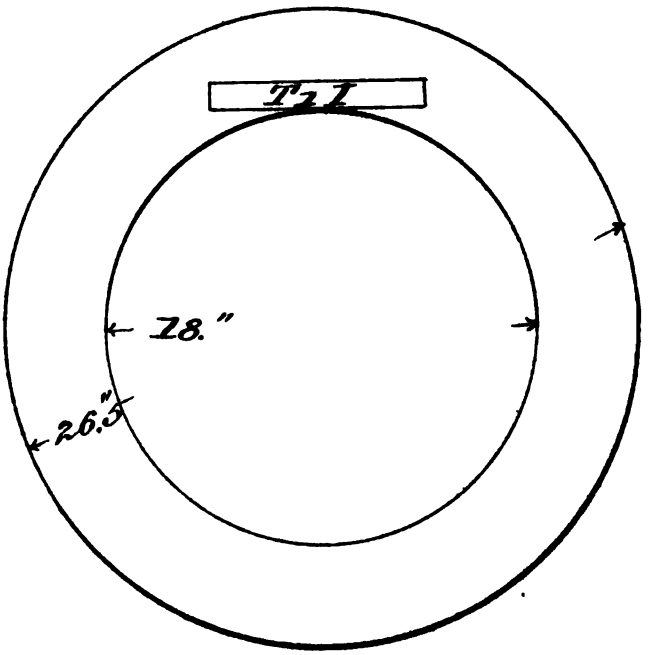
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000283	.000183	0.	.....	
3,750	15,000	.000450	.000167	0.	.....	
5,000	20,000	.000633	.000183	0.	.....	
6,250	25,000	.000800	.000167	0.	.....	
7,500	30,000	.000967	.000167	0.	.....	
8,750	35,000	.001117	.000150	0.	.....	
10,000	40,000	.001283	.000166	0.	.....	
11,250	45,000	.001433	.000150	.....	.....	
11,500	46,000	.001467	.000034	.....	.....	
11,750	47,000	.001517	.000050	.....	.....	
12,000	48,000	.001550	.000033	.....	.....	
12,250	49,000	.001600	.000050	.....	.....	
12,500	50,000	.001633	.000033	.....	.....	
12,750	51,000	.001667	.000034	.....	.....	
13,000	52,000	.001683	.000016	.....	.....	
13,250	53,000	.001717	.000034	.....	.....	
13,500	54,000	.001767	.000050	.....	.....	
13,750	55,000	.001800	.000033	.....	.....	
14,000	56,000	.001833	.000033	.....	.....	
14,250	57,000	.001867	.000034	.....	.....	
14,500	58,000	.001917	.000050	.....	.....	
14,750	59,000	.001950	.000033	.....	.....	
15,000	60,000	.001983	.000033	.....	.....	
15,250	61,000	.002017	.000034	.....	.....	
15,500	62,000	.002050	.000033	.....	.....	Elastic limit.
15,750	63,000	.002150	.000100	.....	.....	
16,000	64,000	.006667	.004517	.....	.....	
16,500	66,000	.008850	.002183	.....	.....	
17,000	68,000	.010000	.001150	.....	.....	
17,500	70,000	.011500	.001500	.....	.....	
18,000	72,000	.013000	.001500	.....	.....	
18,500	74,000	.014500	.001500	.....	.....	
19,000	76,000	.015917	.001417	.....	.....	
19,500	78,000	.017383	.001466	.....	.....	
20,000	80,000	.019167	.001784	.....	.....	
20,500	82,000	.020867	.001700	.....	.....	
21,000	84,000	.022667	.001800	.....	.....	
21,500	86,000	.024750	.002083	.....	.....	
22,000	88,000	.026867	.002117	.....	.....	
22,500	90,000	.0300	.003133	.....	.....	
23,000	92,000	.0333	.0033	.....	.....	
23,500	94,000	.0367	.0034	.....	.....	
24,000	96,000	.0383	.0016	.....	.....	
24,500	98,000	.0433	.0050	.....	.....	
25,000	100,000	.0467	.0034	.....	.....	
25,500	102,000	.0517	.0050	.....	.....	
26,000	104,000	.0600	.0083	.....	.....	
26,500	106,000	.0667	.0067	.....	.....	
27,000	108,000	.0800	.0133	.....	.....	
27,390	109,560	.1133	.0333	.....	.....	Tensile strength.

General summary.

Specific gravity	7.8419
Hardness	21.64
Tensile strength per square inch of original section ..... pounds	109,560
Elastic limit per square inch of original section ..... do	62,000
Elongation per inch after rupture ..... inch	0.1533
Elongation per inch under strain at elastic limit ..... do	.002050
Reduction in diameter at point of rupture ..... do	.144
Reduction in area after rupture, per centum of original section	44.6
Position of rupture	2¾ inches from neck
Character of broken surface	fine silky
Elongation of inch sections	".13, ".23, ".47*, ".11, ".09, ".09

10" Steel B. L. Rifle No. 1

Hoop C1



H Ex 31 49 2

No. 2576.

Marks, $^{10\,R,\,C_1}_{T_1\,I}$
Diameter, ".564.
Sectional area, .25 square inch.

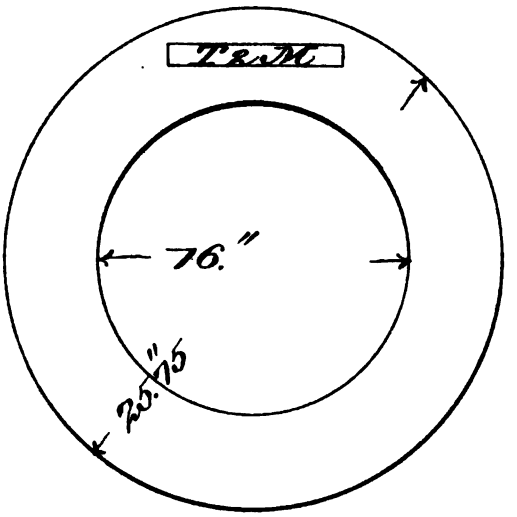
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	.....	
2,500	10,000	.000267	.000117	0.	.....	
3,750	15,000	.000417	.000150	0.	.....	
5,000	20,000	.000567	.000150	0.	.....	
6,250	25,000	.000750	.000183	0.	.....	
7,500	30,000	.000933	.000163	0.	.....	
8,750	35,000	.001100	.000167	.....	.....	
10,000	40,000	.001250	.000150	.....	.....	
11,250	45,000	.001433	.000163	.....	.....	
12,500	50,000	.001600	.000167	.....	.....	
12,750	51,000	.001633	.000033	.....	.....	
13,000	52,000	.001667	.000034	.....	.....	
13,250	53,000	.001700	.000033	.....	.....	
13,500	54,000	.001717	.000017	.....	.....	
13,750	55,000	.001767	.000050	.....	.....	
14,000	56,000	.001817	.000050	.....	.....	
14,250	57,000	.001850	.000033	.....	.....	
14,500	58,000	.001883	.000033	.....	.....	
14,750	59,000	.001917	.000034	.....	.....	
15,000	60,000	.001967	.000050	.....	.....	
15,250	61,000	.002000	.000033	.....	.....	
15,500	62,000	.002033	.000033	.....	.....	
15,750	63,000	.002083	.000050	.....	.....	
16,000	64,000	.002117	.000034	.....	.....	
16,250	65,000	.002150	.000033	.....	.....	
16,500	66,000	.002183	.000033	.....	.....	
16,750	67,000	.002233	.000050	.....	.....	
17,000	68,000	.002300 .013667	.000067 .011367	.....	.....	Elastic limit.
17,250	69,000	.014167	.000500	.....	.....	
17,500	70,000	.014733	.000566	.....	.....	
18,000	72,000	.016500	.001767	.....	.....	
18,500	74,000	.017833	.001333	.....	.....	
19,500	76,000	.019583	.001750	.....	.....	
19,500	78,000	.0208	.001217	.....	.....	
20,000	80,000	.0233	.0025	.....	.....	
20,500	82,000	.0250	.0017	.....	.....	
21,000	84,000	.0267	.0017	.....	.....	
21,500	86,000	.0283	.0016	.....	.....	
22,000	88,000	.0333	.0050	.....	.....	
22,500	90,000	.0350	.0017	.....	.....	
23,000	92,000	.0383	.0033	.....	.....	
23,500	94,000	.0417	.0034	.....	.....	
24,000	96,000	.0450	.0033	.....	.....	
24,500	98,000	.0483	.0033	.....	.....	
25,500	100,000	.0517	.0034	.....	.....	
25,500	102,000	.0567	.0050	.....	.....	
26,000	104,000	.0650	.0083	.....	.....	
26,500	106,000	.0800	.0150	.....	.....	
27,000	108,000	.1067	.0267	.....	.....	
27,180	108,720	.1283	.0216	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	108,720
Elastic limit per square inch of original section	do...	68,000
Elongation per inch after rupture	inch..	0.1550
Elongation per inch under strain at elastic limit	do...	.002300
Reduction in diameter at point of rupture	do...	.094
Reduction in area after rupture, per centum of original section		30.6
Position of rupture		".2 from middle of stem; oblique
Character of broken surface		silky
Elongation of inch sections		".10, ".13, ".31*, ".19, ".12, ".08

10" Steel B. L. Rifle No. 1

New Hoop C 1



H Ex 31 49 2

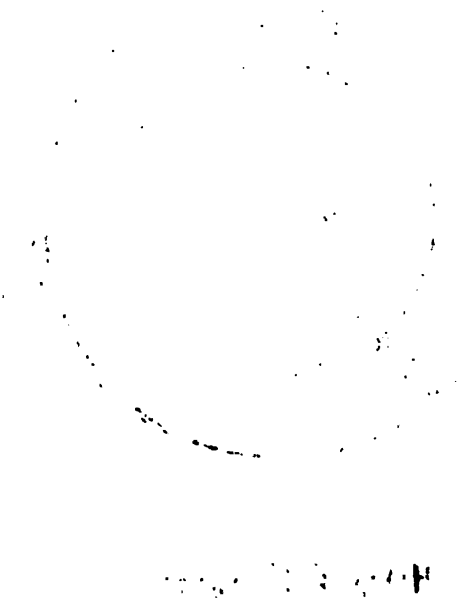
No. 2680.

Marks, $\frac{10\ R_1\ C_1}{T_2\ M}$.
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000283	.000183	0.	.....	
3,750	15,000	.000483	.000200	0.	.....	
5,000	20,000	.000633	.000150	0.	.....	
6,250	25,000	.000800	.000167	0.	.....	
7,500	30,000	.000950	.000150	0.	.....	
8,750	35,000	.001133	.000183	0.	.....	
10,000	40,000	.001300	.000167	0.	.....	
11,250	45,000	.001467	.000167	.....	.....	
12,500	50,000	.001617	.000150	.....	.....	
12,750	51,000	.001650	.000033	.....	.....	
13,000	52,000	.001700	.000050	.....	.....	
13,250	53,000	.001733	.000033	.....	.....	
13,500	54,000	.001750	.000017	.....	.....	
13,750	55,000	.001800	.000050	.....	.....	
14,000	56,000	.001817	.000017	.....	.....	
14,250	57,000	.001867	.000050	.....	.....	
14,500	58,000	.001900	.000033	.....	.....	
14,750	59,000	.001933	.000033	.....	.....	
15,000	60,000	.001950	.000017	.....	.....	
15,250	61,000	.002000	.000050	.....	.....	
15,500	62,000	.002033	.000033	.....	.....	
15,750	63,000	.002083	.000050	.....	.....	
16,000	64,000	.002133	.000050	.....	.....	Elastic limit.
16,250	65,000	.003667	.001534	.....	.....	
16,500	66,000	.006500	.002833	.....	.....	
17,000	68,000	.008333	.001833	.....	.....	
17,500	70,000	.010000	.001667	.....	.....	
18,000	72,000	.011517	.001517	.....	.....	
18,500	74,000	.012833	.001316	.....	.....	
19,000	76,000	.014283	.001450	.....	.....	
19,500	78,000	.015967	.001684	.....	.....	
20,000	80,000	.017433	.001466	.....	.....	
20,500	82,000	.019583	.002150	.....	.....	
21,000	84,000	.021333	.001750	.....	.....	
21,500	86,000	.023333	.002000	.....	.....	
22,000	88,000	.0250	.001667	.....	.....	
22,500	90,000	.0283	.0033	.....	.....	
23,000	92,000	.0317	.0034	.....	.....	
23,500	94,000	.0350	.0033	.....	.....	
24,000	96,000	.0367	.0017	.....	.....	
24,500	98,000	.0383	.0016	.....	.....	
25,000	100,000	.0433	.0050	.....	.....	
25,500	102,000	.0467	.0034	.....	.....	
26,000	104,000	.0517	.0050	.....	.....	
26,500	106,000	.0617	.0100	.....	.....	
27,000	108,000	.0717	.0100	.....	.....	
27,500	110,000	.1017	.0300	.....	.....	
27,510	110,040	.1117	.0100	.....	.....	Tensile strength.

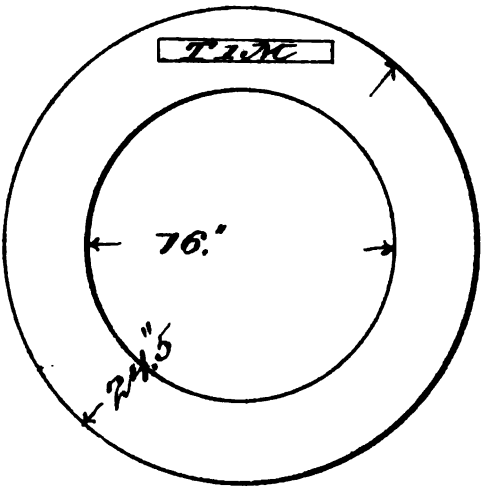
General summary.

Specific gravity		7.8370
Hardness		21.83
Tensile strength per square inch of original section	pounds..	110,040
Elastic limit per square inch of original section	do...	64,000
Elongation per inch after rupture	inch..	0.1550
Elongation per inch under strain at elastic limit	do...	.002133
Reduction in diameter at point of rupture	do...	.154
Reduction in area after rupture, per centum of original section		47.2
Position of rupture		2″.50 from neck
Character of broken surface		fine silky
Elongation of inch sections		″.10, ″.20, ″.32*, ″.12, ″.10, .309



10" Steel B.L. Rifle No. 1

Hoop C 2



H Ex 31 49 2

No. 2778.

Marks, $\frac{10\ R_1\ C_2}{T_1\ M}$
Diameter, ".564.
Sectional area, .25 square inch.

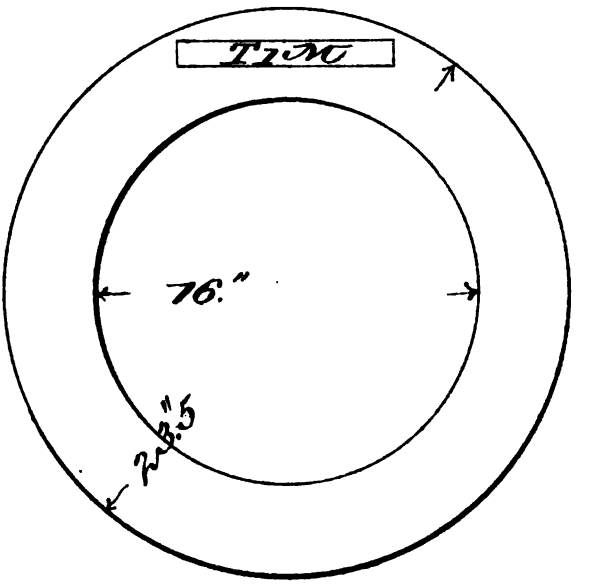
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000317	.000184	0.	.....	
3,750	15,000	.000483	.000166	0.	.....	
5,000	20,000	.000667	.000184	0.	.....	
6,250	25,000	.000833	.000166	0.	.....	
7,500	30,000	.000983	.000150	0.	.....	
8,750	35,000	.001167	.000184	0.	.....	
10,000	40,000	.001333	.000166	0.	.....	
11,250	45,000	.001500	.000167	0.	.....	
12,500	50,000	.001700	.000200	0.	.....	
12,750	51,000	.001717	.000017	.....	.....	
13,000	52,000	.001750	.000033	.....	.....	
13,250	53,000	.001767	.000017	.....	.....	
13,500	54,000	.001800	.000033	.....	.....	
13,750	55,000	.001833	.000033	.....	.....	
14,000	56,000	.001867	.000034	.....	.....	
14,250	57,000	.001900	.000033	.....	.....	
14,500	58,000	.001917	.000017	.....	.....	
14,750	59,000	.001950	.000033	.....	.....	
15,000	60,000	.001983	.000033	.....	.....	
15,250	61,000	.002017	.000034	.....	.....	
15,500	62,000	.002050	.000033	.....	.....	
15,750	63,000	.002100	.000050	.....	.....	
16,000	64,000	.002150	.000050	.....	.....	Elastic limit.
16,250	65,000	.002733	.000583	.....	.....	
16,500	66,000	.003333	.000600	.....	.....	
17,000	68,000	.005083	.001750	.....	.....	
17,500	70,000	.009000	.003917	.....	.....	
18,000	72,000	.010333	.001333	.....	.....	
18,500	74,000	.011667	.001334	.....	.....	
19,000	76,000	.013350	.001683	.....	.....	
19,500	78,000	.015167	.001817	.....	.....	
20,000	80,000	.017500	.002333	.....	.....	
20,500	82,000	.019667	.002167	.....	.....	
21,000	84,000	.021333	.001666	.....	.....	
21,500	86,000	.023450	.002117	.....	.....	
22,000	88,000	.026167	.002717	.....	.....	
22,500	90,000	.028833	.002666	.....	.....	
23,000	92,000	.031500	.002667	.....	.....	
23,500	94,000	.034167	.002667	.....	.....	
24,000	96,000	.037500	.003333	.....	.....	
24,500	98,000	.042667	.005167	.....	.....	
25,000	100,000	.0467	.004033	.....	.....	
25,500	102,000	.0500	.0033	.....	.....	
26,000	104,000	.0567	.0067	.....	.....	
26,500	106,000	.0700	.0133	.....	.....	
26,700	106,800	.....	.....	.....	.....	Tensile strength.

General summary.

Specific gravity		7.8491
Hardness		21.89
Tensile strength per square inch of original section	pounds..	106,800
Elastic limit per square inch of original section	do...	64,000
Elongation per inch after rupture	inch..	0.0767
Elongation per inch under strain at elastic limit	do...	.002150
Reduction in diameter at point of rupture	do...	.034
Reduction in area after rupture, per centum of original section		11.8
Position of rupture		".30 from neck
Character of broken surface		granular, with radial section of silky metal
Elongation of inch sections		".05, ".06, ".06, ".08, ".08, ".13

10" Steel B. L. Rifle No. 1

Hoop C 3



H Ex 31 49 2

No. 2646.

Marks, $^{10}_{T,M}R_1C_2$
Diameter, ″.564.
Sectional area, .25 square inch.

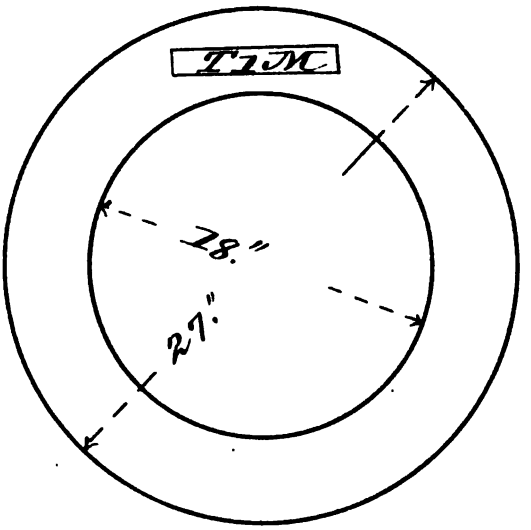
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000233	.000116	0.	.....	
3,750	15,000	.000450	.000217	0.	.....	
5,000	20,000	.000633	.000183	0.	.....	
6,250	25,000	.000800	.000167	.000017	.000017	
7,500	30,000	.000983	.000183	.000017	0.	
8,750	35,000	.001150	.000167	.000017	0.	
10,000	40,000	.001317	.000167	.000017	0.	
11,250	45,000	.001483	.000166	.000033	.000016	
12,500	50,000	.001650	.000167	.000033	0.	
12,750	51,000	.001683	.000033	.....	.....	
13,000	52,000	.001717	.000034	.....	.....	
13,250	53,000	.001733	.000016	.....	.....	
13,500	54,000	.001750	.000017	.....	.....	
13,750	55,000	.001783	.000033	.....	.....	
14,000	56,000	.001817	.000034	.....	.....	
14,250	57,000	.001850	.000033	.....	.....	
14,500	58,000	.001883	.000033	.....	.....	
14,750	59,000	.001933	.000050	.....	.....	
15,000	60,000	.001967	.000034	.....	.....	
15,500	62,000	.002033	.000066	.....	.....	Elastic limit.
15,750	63,000	.010183	.008150	.....	.....	
16,000	64,000	.011133	.000950	.....	.....	
16,500	66,000	.012833	.001700	.....	.....	
17,000	68,000	.014583	.001750	.....	.....	
17,500	70,000	.016333	.001750	.....	.....	
18,000	72,000	.018283	.001950	.....	.....	
18,500	74,000	.020200	.001917	.....	.....	
19,000	76,000	.022283	.002083	.....	.....	
19,500	78,000	.024683	.002400	.....	.....	
20,000	80,000	.026883	.002200	.....	.....	
20,500	82,000	.029667	.002784	.....	.....	
21,000	84,000	.032533	.002866	.....	.....	
21,500	86,000	.035500	.002967	.....	.....	
22,000	88,000	.039167	.003667	.....	.....	
22,500	90,000	.0417	.002533	.....	.....	
23,000	92,000	.0483	.0066	.....	.....	
23,500	94,000	.0533	.0050	.....	.....	
24,000	96,000	.0650	.0117	.....	.....	
24,500	98,000	.0767	.0117	.....	.....	
25,000	100,000	.1000	.0233	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	100,000
Elastic limit per square inch of original section	do...	62,000
Elongation per inch after rupture	inch..	0.1633
Elongation per inch under strain at elastic limit	do...	.002033
Reduction in diameter at point of rupture	do...	.164
Reduction in area after rupture, per centum of original section		49.7
Position of rupture		1″.08 from neck
Character of broken surface		silky
Elongation of inch sections		″.08, ″.10, ″.11, ″.13, ″.20, ″.26*

10" Steel B.L. Rifle No.1.

Hoop C5



H Ex 31 49 2

No. 2208.

Marks, $^{10}_{T_1}\mathrm{R_1C_8}$
Diameter, ".545.
Sectional area, .233 square inch.

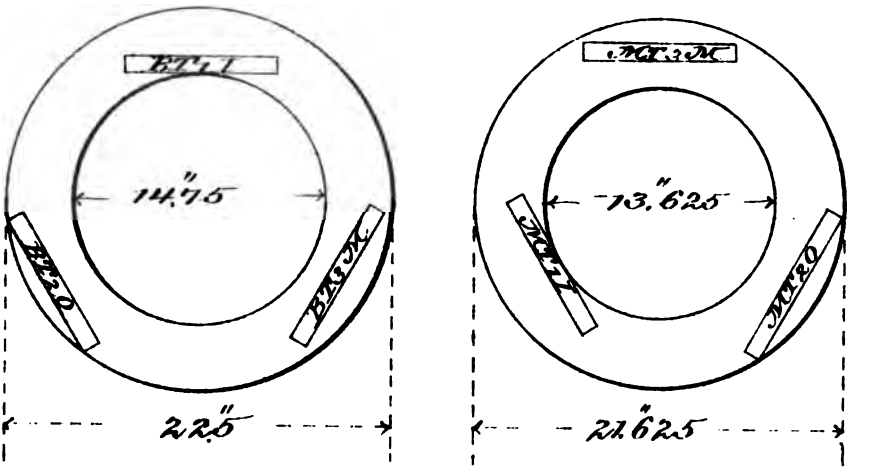
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
233	1,000	0.	0.	0.	0.	Initial load.
1,165	5,000	.000067	.000067	0.	.....	
2,330	10,000	.000217	.000150	0.	.....	
3,495	15,000	.000367	.000150	0.	.....	
4,660	20,000	.000550	.000183	0.	.....	
5,825	25,000	.000700	.000150	0.	.....	
6,990	30,000	.000883	.000183	0.	.....	
8,155	35,000	.001033	.000150	0.	.....	
9,320	40,000	.001200	.000167	0.	.....	
10,485	45,000	.001400	.000200	.000033	.000033	
10,718	46,000	.001450	.000050	.....	.....	
10,951	47,000	.001500	.000050	.....	.....	Elastic limit.
11,184	48,000	.001583	.000083	.....	.....	
11,417	49,000	.001683	.000100	.....	.....	
11,650	50,000	.001783	.000100	.000217	.000184	
11,883	51,000	.002067	.000284	.....	.....	
12,116	52,000	.002300	.000233	.....	.....	
12,349	53,000	.002983	.000683	.....	.....	
12,582	54,000	.003533	.000550	.....	.....	
12,815	55,000	.004400	.000867	.....	.....	
13,048	56,000	.005500	.001100	.....	.....	
13,281	57,000	.006833	.001333	.....	.....	
13,514	58,000	.007467	.000634	.....	.....	
13,747	59,000	.008467	.001000	.....	.....	
13,980	60,000	.009967	.001500	.....	.....	
14,446	62,000	.011867	.001900	.....	.....	
14,912	64,000	.013617	.001750	.....	.....	
15,378	66,000	.016200	.002583	.....	.....	
15,844	68,000	.018117	.001917	.....	.....	
16,310	70,000	.020633	.002516	.....	.....	
16,776	72,000	.023317	.002684	.....	.....	
17,242	74,000	.025917	.002600	.....	.....	
17,708	76,000	.029583	.003666	.....	.....	
18,174	78,000	.033167	.003584	.....	.....	
18,640	80,000	.0350	.001833	.....	.....	
19,106	82,000	.0417	.0067	.....	.....	
19,572	84,000	.0483	.0066	.....	.....	
20,038	86,000	.0550	.0067	.....	.....	
20,504	88,000	.0633	.0083	.....	.....	
20,970	90,000	.0783	.0150	.....	.....	
21,290	91,370	.1167	.0384	.....	.....	Tensile strength.

General summary.

Specific gravity	7.8546
Hardness	18.19
Tensile strength per square inch of original section ..... pounds..	91,370
Elastic limit per square inch of original section ..... do...	47,000
Elongation per inch after rupture ..... inch..	0.1483
Elongation per inch under strain at elastic limit ..... do...	.001500
Reduction in diameter at point of rupture ..... do...	.105
Reduction in area after rupture, per centum of original section	34.7
Position of rupture	2".9 from neck
Character of broken surface, granular; dull spot at circumference; opened a crack in the stem 1½ inches from point of rupture.	
Elongation of inch sections	".11, ".15, ".33*, ".14, ".09, ".07

10" Steel B. L. Rifle No. 1

Hoop C5



H Ex 31 492

No. 2763.

Marks, $^{10}_{B}\,R_1\,C_5\,T_2\,O$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000300	.000167	0.	.....	
3,750	15,000	.000450	.000150	0.	.....	
5,000	20,000	.000617	.000167	0.	.....	
6,250	25,000	.000783	.000166	0.	.....	
7,500	30,000	.000950	.000167	0.	.....	
8,750	35,000	.001117	.000167	0.	.....	
10,000	40,000	.001283	.000166	0.	.....	
11,250	45,000	.001450	.000167	.....	.....	
12,500	50,000	.001633	.000183	.....	.....	
13,750	55,000	.001833	.000200	.....	.....	
14,000	56,000	.001867	.000034	.....	.....	
14,250	57,000	.001917	.000050	.....	.....	
14,500	58,000	.001967	.000050	.....	.....	Elastic limit.
14,750	59,000	.002167	.000200	.....	.....	
15,000	60,000	.002417	.000250	.....	.....	
15,250	61,000	.002733	.000316	.....	.....	
15,500	62,000	.003183	.000450	.....	.....	
16,000	64,000	.004333	.001150	.....	.....	
16,500	66,000	.005833	.001500	.....	.....	
17,000	68,000	.007000	.001167	.....	.....	
17,500	70,000	.008417	.001417	.....	.....	
18,000	72,000	.009600	.001183	.....	.....	
18,500	74,000	.010917	.001317	.....	.....	
19,000	76,000	.012167	.001250	.....	.....	
19,500	78,000	.013533	.001366	.....	.....	
20,000	80,000	.015000	.001467	.....	.....	
20,500	82,000	.016533	.001533	.....	.....	
21,000	84,000	.018333	.001800	.....	.....	
21,500	86,000	.020000	.001667	.....	.....	
22,000	88,000	.021667	.001667	.....	.....	
22,500	90,000	.023500	.001833	.....	.....	
23,000	92,000	.025833	.002333	.....	.....	
23,500	94,000	.027917	.002084	.....	.....	
24,000	96,000	.030100	.002183	.....	.....	
24,500	98,000	.0333	.0032	.....	.....	
25,000	100,000	.0367	.0034	.....	.....	
25,500	102,000	.0400	.0033	.....	.....	
26,000	104,000	.0433	.0033	.....	.....	
26,500	106,000	.0483	.0050	.....	.....	
27,000	108,000	.0533	.0050	.....	.....	
27,500	110,000	.0617	.0084	.....	.....	
28,000	112,000	.0767	.0150	.....	.....	
28,450	113,800	.1133	.0266	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	113,800
Elastic limit per square inch of original section	do...	58,000
Elongation per inch after rupture	inch..	0.1033
Elongation per inch under strain at elastic limit	do...	.001967
Reduction in diameter at point of rupture	do...	.044
Reduction in area after rupture, per centum of original section		15.0
Position of rupture		″.05 from middle of stem
Character of broken surface		granular; radiating from a dull spot at circumference
Elongation of inch sections		″.07, ″.12, ″.15*, ″.11, ″.10, ″.07

No. 2764.

Marks, $^{10\ R,\ C}_{B\ T,\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000283	.000166	0.	.....	
3,750	15,000	.000450	.000167	0.	.....	
5,000	20,000	.000600	.000150	0.	.....	
6,250	25,000	.000767	.000167	0.	.....	
7,500	30,000	.000950	.000183	0.	.....	
8,750	35,000	.001100	.000150	0.	.....	
10,000	40,000	.001267	.000167	0.	.....	
11,250	45,000	.001450	.000183	.....	.....	
12,500	50,000	.001633	.000183	.....	.....	
12,750	51,000	.001667	.000034	.....	.....	
13,000	52,000	.001683	.000016	.....	.....	
13,250	53,000	.001717	.000034	.....	.....	
13,500	54,000	.001750	.000033	.....	.....	
13,750	55,000	.001783	.000033	.....	.....	
14,000	56,000	.001850	.000067	.....	.....	
14,250	57,000	.001900	.000050	.....	.....	
14,500	58,000	.001967	.000067	.....	.....	
14,750	59,000	.002050	.000083	.....	.....	Elastic limit.
15,000	60,000	.002217	.000167	.....	.....	
15,250	61,000	.002500	.000283	.....	.....	
15,500	62,000	.002917	.000417	.....	.....	
16,000	64,000	.004217	.001300	.....	.....	
16,500	66,000	.005583	.001366	.....	.....	
17,000	68,000	.007167	.001584	.....	.....	
17,500	70,000	.008667	.001500	.....	.....	
18,000	72,000	.010333	.001666	.....	.....	
18,500	74,000	.011700	.001367	.....	.....	
19,000	76,000	.013117	.001417	.....	.....	
19,500	78,000	.014600	.001483	.....	.....	
20,000	80,000	.016417	.001817	.....	.....	
20,500	82,000	.017867	.001450	.....	.....	
21,000	84,000	.019667	.001800	.....	.....	
21,500	86,000	.021333	.001666	.....	.....	
22,000	88,000	.023300	.001967	.....	.....	
22,500	90,000	.025600	.002300	.....	.....	
23,000	92,000	.028000	.002400	.....	.....	
23,500	94,000	.030367	.002367	.....	.....	
24,000	96,000	.0333	.002933	.....	.....	
24,500	98,000	.0367	.0034	.....	.....	
25,000	100,000	.0400	.0033	.....	.....	
25,500	102,000	.0433	.0033	.....	.....	
26,000	104,000	.0483	.0050	.....	.....	
26,500	106,000	.0550	.0067	.....	.....	
27,000	108,000	.0667	.0117	.....	.....	
27,500	110,000	.0833	.0166	.....	.....	
27,700	110,080	.1017	.0184	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	110,800
Elastic limit per square inch of original section	do...	59,000
Elongation per inch after rupture	inch..	0.1333
Elongation per inch under strain at elastic limit	do...	.002050
Reduction in diameter at point of rupture	do...	.104
Reduction in area after rupture, per centum of original section		33.5
Position of rupture		1″.50 from neck
Character of broken surface		granular; silky center
Elongation of inch sections		″.07, ″.08, ″.10, ″.12, ″.29*, ″.1*

No. 2765.

Marks, $\frac{10\ R_1\ C_5}{M\ T,\ I}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000300	.000167	0.	.....	
3,750	15,000	.000450	.000150	0.	.....	
5,000	20,000	.000633	.000183	0.	.....	
6,250	25,000	.000783	.000150	0.	.....	
7,500	30,000	.000950	.000167	0.	.....	
8,750	35,000	.001117	.000167	0.	.....	
10,000	40,000	.001300	.000183	0.	.....	
11,250	45,000	.001467	.000167	.....	.....	
12,500	50,000	.001633	.000166	.....	.....	
12,750	51,000	.001667	.000034	.....	.....	
13,000	52,000	.001700	.000033	.....	.....	
13,250	53,000	.001717	.000017	.....	.....	
13,500	54,000	.001767	.000050	.....	.....	
13,750	55,000	.001817	.000050	.....	.....	Elastic limit.
14,000	56,000	.001900	.000083	.....	.....	
14,250	57,000	.001983	.000083	.....	.....	
14,500	58,000	.002150	.000167	.....	.....	
14,750	59,000	.002333	.000183	.....	.....	
15,000	60,000	.002667	.000334	.....	.....	
15,500	62,000	.003633	.000966	.....	.....	
16,000	64,000	.004750	.001117	.....	.....	
16,500	66,000	.005950	.001200	.....	.....	
17,000	68,000	.007767	.001817	.....	.....	
17,500	70,000	.010000	.002233	.....	.....	
18,000	72,000	.011133	.001133	.....	.....	
18,500	74,000	.012250	.001117	.....	.....	
19,000	76,000	.013683	.001433	.....	.....	
19,500	78,000	.015667	.001984	.....	.....	
20,000	80,000	.017500	.001833	.....	.....	
20,500	82,000	.019500	.002000	.....	.....	
21,000	84,000	.021333	.001833	.....	.....	
21,500	86,000	.023333	.002000	.....	.....	
22,000	88,000	.025750	.002417	.....	.....	
22,500	90,000	.028083	.002333	.....	.....	
23,000	92,000	.030833	.002750	.....	.....	
23,500	94,000	.0333	.0024	.....	.....	
24,000	96,000	.0367	.0034	.....	.....	
24,500	98,000	.0417	.0050	.....	.....	
25,000	100,000	.0467	.0050	.....	.....	
25,500	102,000	.0517	.0050	.....	.....	
26,000	104,000	.0600	.0083	.....	.....	
26,500	106,000	.0717	.0117	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	106,000
Elastic limit per square inch of original section	do...	55,000
Elongation per inch after rupture	inch..	0.0683
Elongation per inch under strain at elastic limit	do...	.001817
Reduction in diameter at point of rupture	do...	.024
Reduction in area after rupture, per centum of original section		8.4
Position of rupture		½ inch from neck
Character of broken surface		granular; radiating from a flaky spot near circumference
Elongation of inch sections		".05, ".07, ".06, ".06, ".06, ".11"

No. 2766.

Marks, $\frac{10\ R_1\ C_5}{M\ T_2\ O}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	.....	
2,500	10,000	.000317	.000167	0.	.....	
3,750	15,000	.000483	.000166	0.	.....	
5,000	20,000	.000633	.000150	0.	.....	
6,250	25,000	.000800	.000167	0.	.....	
7,500	30,000	.000983	.000183	0.	.....	
8,750	35,000	.001150	.000167	0.	.....	
10,000	40,000	.001317	.000167	0.	.....	
11,250	45,000	.001483	.000166	.....	.....	
12,500	50,000	.001650	.000167	.....	.....	
12,750	51,000	.001683	.000033	.....	.....	
13,000	52,000	.001717	.000034	.....	.....	
13,250	53,000	.001767	.000050	.....	.....	
13,500	54,000	.001800	.000033	.....	.....	
13,750	55,000	.001833	.000033	.....	.....	
14,000	56,000	.001867	.000034	.....	.....	
14,250	57,000	.001900	.000033	.....	.....	
14,500	58,000	.001933	.000033	.....	.....	
14,750	59,000	.001983	.000050	.....	.....	
15,000	60,000	.002033	.000050	.....	.....	Elastic limit.
15,250	61,000	.002117	.000084	.....	.....	
15,500	62,000	.002200	.000083	.....	.....	
15,750	63,000	.002300	.000100	.....	.....	
16,000	64,000	.002500	.000200	.....	.....	
16,250	65,000	.002717	.000217	.....	.....	
16,500	66,000	.003183	.000466	.....	.....	
17,000	68,000	.004167	.000984	.....	.....	
17,500	70,000	.005217	.001050	.....	.....	
18,000	72,000	.006500	.001283	.....	.....	
18,500	74,000	.007683	.001183	.....	.....	
19,000	76,000	.009017	.001334	.....	.....	
19,500	78,000	.010233	.001216	.....	.....	
20,000	80,000	.011583	.001350	.....	.....	
20,500	82,000	.013083	.001500	.....	.....	
21,000	84,000	.014383	.001300	.....	.....	
21,500	86,000	.015917	.001534	.....	.....	
22,000	88,000	.017500	.001583	.....	.....	
22,500	90,000	.019017	.001517	.....	.....	
23,000	92,000	.020767	.001750	.....	.....	
23,500	94,000	.022500	.001733	.....	.....	
24,000	96,000	.024333	.001833	.....	.....	
24,500	98,000	.026333	.002000	.....	.....	
25,000	100,000	.028500	.002167	.....	.....	
25,500	102,000	.0317	.0032	.....	.....	
26,000	104,000	.0350	.0033	.....	.....	
26,500	106,000	.0367	.0017	.....	.....	
27,000	108,000	.0417	.0050	.....	.....	
27,500	110,000	.0467	.0050	.....	.....	
28,000	112,000	.0517	.0050	.....	.....	
28,500	114,000	.0550	.0033	.....	.....	
29,000	116,000	.0667	.0117	.....	.....	
29,500	118,000	.0800	.0133	.....	.....	
29,620	118,480	.0983	.0183	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	118,480
Elastic limit per square inch of original section	do...	60,000
Elongation per inch after rupture	inch..	0.1150
Elongation per inch under strain at elastic limit	do...	.002033
Reduction in diameter at point of rupture	do...	.084
Reduction in area after rupture, per centum of original section		27.6
Position of rupture		″.05 from middle of stem
Character of broken surface		granular; silky center
Elongation of inch sections		″.07, ″.10, ″.23*, ″.15, ″.08, ″.06

No. 2767.

Marks, $\frac{10\ R,\ C_2}{M\ T_2\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	.....	
2,500	10,000	.000317	.000167	0.	.....	
3,750	15,000	.000467	.000150	0.	.....	
5,000	20,000	.000650	.000183	0.	.....	
6,250	25,000	.000800	.000150	0.	.....	
7,500	30,000	.000967	.000167	0.	.....	
8,750	35,000	.001133	.000166	0.	.....	
10,000	40,000	.001300	.000167	0.	.....	
11,250	45,000	.001483	.000183	.....	.....	
12,500	50,000	.001683	.000200	.....	.....	
12,750	51,000	.001733	.000050	.....	.....	
13,000	52,000	.001800	.000067	.....	.....	Elastic limit.
13,250	53,000	.002200	.000400	.....	.....	
13,500	54,000	.002750	.000550	.....	.....	
13,750	55,000	.003217	.000467	.....	.....	
14,000	56,000	.003850	.000633	.....	.....	
14,250	57,000	.004500	.000650	.....	.....	
14,500	58,000	.005183	.000683	.....	.....	
14,750	59,000	.005700	.000517	.....	.....	
15,000	60,000	.006300	.000600	.....	.....	
15,500	62,000	.007433	.001133	.....	.....	
16,000	64,000	.008717	.001284	.....	.....	
16,500	66,000	.010167	.001450	.....	.....	
17,000	68,000	.011417	.001250	.....	.....	
17,500	70,000	.013000	.001583	.....	.....	
18,000	72,000	.014750	.001750	.....	.....	
18,500	74,000	.016267	.001517	.....	.....	
19,000	76,000	.017750	.001483	.....	.....	
19,500	78,000	.019500	.001750	.....	.....	
20,000	80,000	.021167	.001667	.....	.....	
20,500	82,000	.022917	.001750	.....	.....	
21,000	84,000	.024917	.002000	.....	.....	
21,500	86,000	.027333	.002416	.....	.....	
22,000	88,000	.029583	.002250	.....	.....	
22,500	90,000	.033	.003717	.....	.....	
23,000	92,000	.0367	.0034	.....	.....	
23,500	94,000	.0383	.0016	.....	.....	
24,000	96,000	.0433	.0050	.....	.....	
24,500	98,000	.0467	.0034	.....	.....	
25,000	100,000	.0533	.0066	.....	.....	
25,500	102,000	.0617	.0084	.....	.....	
26,000	104,000	.0700	.0083	.....	.....	
26,500	106,000	.0883	.0183	.....	.....	
26,640	106,560	.1117	.0234	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	106,560
Elastic limit per square inch of original section	do...	52,000
Elongation per inch after rupture	inch..	0.1250
Elongation per inch under strain at elastic limit	do...	.001800
Reduction in diameter at point of rupture	do...	.094
Reduction in area after rupture, per centum of original section		30.6
Position of rupture		1″.85 from neck
Character of broken surface		granular; silky center
Elongation of inch sections		″.08, ″.28*, ″.12, ″.10, ″.10, ″.07

No. 2767.

Marks, $\frac{10\ R_1\ C_5}{M\ T_2\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.

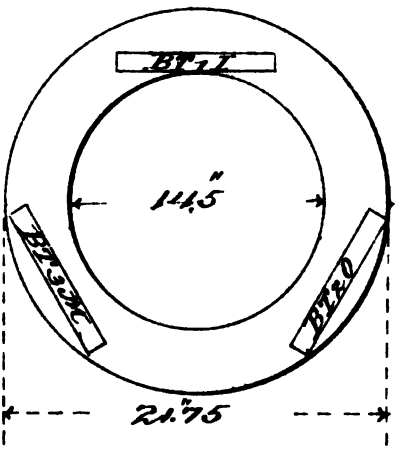
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.		
2,500	10,000	.000317	.000167	0.		
3,750	15,000	.000467	.000150	0.		
5,000	20,000	.000650	.000183	0.		
6,250	25,000	.000800	.000150	0.		
7,500	30,000	.000967	.000167	0.		
8,750	35,000	.001133	.000166	0.		
10,000	40,000	.001300	.000167	0.		
11,250	45,000	.001483	.000183			
12,500	50,000	.001683	.000200			
12,750	51,000	.001733	.000050			
13,000	52,000	.001800	.000067			Elastic limit.
13,250	53,000	.002200	.000400			
13,500	54,000	.002750	.000550			
13,750	55,000	.003217	.000467			
14,000	56,000	.003850	.000633			
14,250	57,000	.004500	.000650			
14,500	58,000	.005183	.000683			
14,750	59,000	.005700	.000517			
15,000	60,000	.006300	.000600			
15,500	62,000	.007433	.001133			
16,000	64,000	.008717	.001284			
16,500	66,000	.010167	.001450			
17,000	68,000	.011417	.001250			
17,500	70,000	.013000	.001583			
18,000	72,000	.014750	.001750			
18,500	74,000	.016267	.001517			
19,000	76,000	.017750	.001483			
19,500	78,000	.019500	.001750			
20,000	80,000	.021167	.001667			
20,500	82,000	.022917	.001750			
21,000	84,000	.024917	.002000			
21,500	86,000	.027333	.002416			
22,000	88,000	.029583	.002250			
22,500	90,000	.033	.003717			
23,000	92,000	.0367	.0034			
23,500	94,000	.0383	.0016			
24,000	96,000	.0433	.0050			
24,500	98,000	.0467	.0034			
25,000	100,000	.0533	.0066			
25,500	102,000	.0617	.0084			
26,000	104,000	.0700	.0083			
26,500	106,000	.0883	.0183			
26,640	106,560	.1117	.0234			Tensile strength.

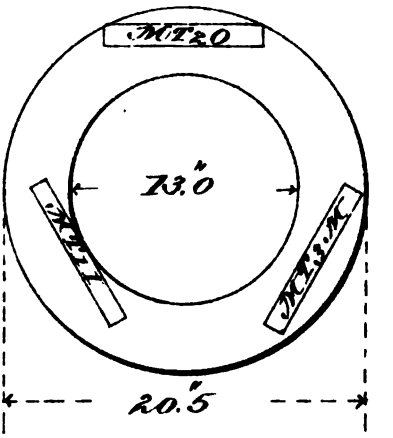
General summary.

Tensile strength per square inch of original section	pounds..	106,560
Elastic limit per square inch of original section	do...	52,000
Elongation per inch after rupture	inch..	0.1250
Elongation per inch under strain at elastic limit	do...	.001800
Reduction in diameter at point of rupture	do...	.094
Reduction in area after rupture, per centum of original section		30.6
Position of rupture		1″.85 from neck
Character of broken surface		granular; silky center
Elongation of inch sections		″.08, ″.28*, ″.12, ″.10, ″.10, ″.07

10" Steel B.L. Rifle No 1

Hoop C 6





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No. 2750.

Marks, $\frac{10\ R,\ C}{B\ T,\ I}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	.....	
2,500	10,000	.000317	.000167	0.	.....	
3,750	15,000	.000483	.000166	0.	.....	
5,000	20,000	.000650	.000167	0.	.....	
6,250	25,000	.000800	.000150	0.	.....	
7,500	30,000	.000983	.000183	0.	.....	
8,750	35,000	.001150	.000167	0.	.....	
10,000	40,000	.001333	.000183	.000017	.000017	
11,250	45,000	.001500	.000167	.....	.....	
12,500	50,000	.001667	.000167	.....	.....	
12,750	51,000	.001683	.000016	.....	.....	
13,000	52,000	.001717	.000034	.....	.....	
13,250	53,000	.001767	.000050	.....	.....	
13,500	54,000	.001817	.000050	.....	.....	
13,750	55,000	.001850	.000033	.....	.....	
14,000	56,000	.001883	.000033	.....	.....	
14,250	57,000	.001917	.000034	.....	.....	
14,500	58,000	.001967	.000050	.....	.....	
14,750	59,000	.002000	.000033	.....	.....	
15,000	60,000	.002117	.000117	.....	.....	
15,250	61,000	.002167	.000050	.....	.....	Elastic limit.
15,500	62,000	.002317	.000150	.....	.....	
15,750	63,000	.002433	.000116	.....	.....	
16,000	64,000	.002667	.000234	.....	.....	
16,250	65,000	.002917	.000250	.....	.....	
16,500	66,000	.003300	.000383	.....	.....	
17,000	68,000	.004183	.000883	.....	.....	
17,500	70,000	.005333	.001150	.....	.....	
18,000	72,000	.006667	.001334	.....	.....	
18,500	74,000	.008333	.001666	.....	.....	
19,000	76,000	.010000	.001667	.....	.....	
19,500	78,000	.011667	.001667	.....	.....	
20,000	80,000	.013333	.001666	.....	.....	
20,500	82,000	.015117	.001784	.....	.....	
21,000	84,000	.016833	.001716	.....	.....	
21,500	86,000	.018833	.002000	.....	.....	
22,000	88,000	.020833	.002000	.....	.....	
22,500	90,000	.022500	.001667	.....	.....	
23,000	92,000	.024833	.002333	.....	.....	
23,500	94,000	.027333	.002500	.....	.....	
24,000	96,000	.030000	.002667	.....	.....	
24,500	98,000	.0317	.0017	.....	.....	
25,000	100,000	.0350	.0033	.....	.....	
25,500	102,000	.0383	.0033	.....	.....	
26,000	104,000	.0450	.0067	.....	.....	
26,500	106,000	.0500	.0050	.....	.....	
27,000	108,000	.0567	.0067	.....	.....	
27,500	110,000	.0683	.0116	.....	.....	
27,910	111,640	.0983	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	111,640
Elastic limit per square inch of original section	....do...	61,000
Elongation per inch after rupture	inch..	0.1167
Elongation per inch under strain at elastic limit	....do...	.002167
Reduction in diameter at point of rupture	....do...	.104
Reduction in area after rupture, per centum of original section		33.5
Position of rupture		⅞ inch from neck
Character of broken surface		granular; silky spot in center
Elongation of inch sections		".26*, ".09, ".07, ".08, ".09, ".11

No. 2751.

Marks, $\overset{10\ B_1\ C_6}{B\ T_2\ O}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000283	.000166	0.	.....	
3,750	15,000	.000450	.000167	0.	.....	
5,000	20,000	.000600	.000150	0.	.....	
6,250	25,000	.000767	.000167	0.	.....	
7,500	30,000	.000950	.000183	0.	.....	
8,750	35,000	.001117	.000167	0.	.....	
10,000	40,000	.001283	.000166	0.	.....	
11,250	45,000	.001433	.000150	.....	.....	
12,500	50,000	.001633	.000200	.....	.....	
12,750	51,000	.001667	.000034	.....	.....	
13,000	52,000	.001683	.000016	.....	.....	
13,250	53,000	.001733	.000050	.....	.....	
13,500	54,000	.001783	.000050	.....	.....	
13,750	55,000	.001833	.000050	.....	.....	
14,000	56,000	.001867	.000034	.....	.....	Elastic limit.
14,250	57,000	.002017	.000150	.....	.....	
14,500	58,000	.002300	.000283	.....	.....	
14,750	59,000	.002517	.000217	.....	.....	
15,000	60,000	.002833	.000316	.....	.....	
15,500	62,000	.004000	.001167	.....	.....	
16,000	64,000	.005333	.001333	.....	.....	
16,500	66,000	.006583	.001250	.....	.....	
17,000	68,000	.007800	.001217	.....	.....	
17,500	70,000	.009167	.001367	.....	.....	
18,000	72,000	.010917	.001750	.....	.....	
18,500	74,000	.011950	.001033	.....	.....	
19,000	76,000	.013533	.001583	.....	.....	
19,500	78,000	.015117	.001584	.....	.....	
20,000	80,000	.016700	.001583	.....	.....	
20,500	82,000	.018333	.001633	.....	.....	
21,000	84,000	.020050	.001717	.....	.....	
21,500	86,000	.021867	.001817	.....	.....	
22,000	88,000	.024000	.002133	.....	.....	
22,500	90,000	.026333	.002333	.....	.....	
23,000	92,000	.028333	.002000	.....	.....	
23,500	94,000	.030833	.002500	.....	.....	
24,000	96,000	0333	.002467	.....	.....	
24,500	98,000	.0367	.0034	.....	.....	
25,000	100,000	.0417	.0050	.....	.....	
25,500	102,000	.0450	.0033	.....	.....	
26,000	104,000	.0517	.0067	.....	.....	
26,500	106,000	.0567	.0050	.....	.....	
27,000	108,000	.0683	.0116	.....	.....	
27,500	110,000	.0967	.0284	.....	.....	
27,520	110,080	.1000	.0033	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	110,080
Elastic limit per square inch of original section	do...	56,000
Elongation per inch after rupture	inch..	0.1233
Elongation per inch under strain at elastic limit	do...	.001867
Reduction in diameter at point of rupture	do...	.104
Reduction in area after rupture, per centum of original section		33.5
Position of rupture		1″.84 from neck
Character of broken surface		granular; silky center
Elongation of inch sections		″.06, ″.08, ″.10, ″.13, ″.26*, ″.11

No. 2652.

Marks, $\frac{10\ R_1\ C_6}{B\ T_2\ M}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000283	.000166	0.	.....	
3,750	15,000	.000467	.000184	0.	.....	
5,000	20,000	.000617	.000150	0.	.....	
6,250	25,000	.000783	.000166	0.	.....	
7,500	30,000	.000950	.000167	0.	.....	
8,750	35,000	.001133	.000183	0.	.....	
10,000	40,000	.001300	.000167	0.	.....	
11,250	45,000	.001467	.000167	.....	.....	
12,500	50,000	.001633	.000166	.....	.....	
12,750	51,000	.001667	.000034	.....	.....	
13,000	52,000	.001700	.000033	.....	.....	
13,250	53,000	.001733	.000033	.....	.....	
13,500	54,000	.001783	.000050	.....	.....	
13,750	55,000	.001833	.000050	.....	.....	
14,000	56,000	.001867	.000034	.....	.....	
14,250	57,000	.001933	.000066	.....	.....	Elastic limit.
14,500	58,000	.002117	.000184	.....	.....	
14,750	59,000	.002250	.000133	.....	.....	
15,000	60,000	.002583	.000333	.....	.....	
15,500	62,000	.003550	.000967	.....	.....	
16,000	64,000	.005117	.001567	.....	.....	
16,500	66,000	.006350	.001233	.....	.....	
17,000	68,000	.007750	.001400	.....	.....	
17,500	70,000	.009167	.001417	.....	.....	
18,000	72,000	.010667	.001500	.....	.....	
18,500	74,000	.011950	.001283	.....	.....	
19,000	76,000	.013417	.001467	.....	.....	
19,500	78,000	.014917	.001500	.....	.....	
20,000	80,000	.016500	.001583	.....	.....	
20,500	82,000	.018181	.001683	.....	.....	
21,000	84,000	.019917	.001734	.....	.....	
21,500	86,000	.021867	.001950	.....	.....	
22,000	88,000	.024167	.002300	.....	.....	
22,500	90,000	.026083	.001916	.....	.....	
23,000	92,000	.028250	.002167	.....	.....	
23,500	94,000	.030583	.002333	.....	.....	
24,000	96,000	.0333	.002717	.....	.....	
24,500	98,000	.0367	.0034	.....	.....	
25,000	100,000	.0400	.0033	.....	.....	
25,500	102,000	.0467	.0067	.....	.....	
26,000	104,000	.0517	.0050	.....	.....	
26,500	106,000	.0567	.0050	.....	.....	
27,000	108,000	.0667	.0100	.....	.....	
27,500	110,000	.0850	.0183	.....	.....	
27,630	110,520	.1067	.0217	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	110,520
Elastic limit per square inch of original section	do...	57,000
Elongation per inch after rupture	inch..	0.1467
Elongation per inch under strain at elastic limit	do...	.001933
Reduction in diameter at point of rupture	do...	.104
Reduction in area after rupture, per centum of original section		33.5
Position of rupture		3 inches from neck
Character of broken surface		granular; silky center
Elongation of inch sections		".10, ".16, ".29*, ".15, ".10, ".08

No. 2753.

Marks, $\frac{10\ R_1\ C_4}{M\ T_1\ 1}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	.....	
2,500	10,000	.000333	.000166	0.	.....	
3,750	15,000	.000500	.000167	0.	.....	
5,000	20,000	.000650	.000150	0.	.....	
6,250	25,000	.000817	.000167	0.	.....	
7,500	30,000	.000983	.000166	0.	.....	
8,750	35,000	.001183	.000200	0.	.....	
10,000	40,000	.001367	.000184	0.	.....	
11,250	45,000	.001533	.000166	.....	.....	
12,500	50,000	.001717	.000184	.....	.....	
12,750	51,000	.001767	.000050	.....	.....	
13,000	52,000	.001817	.000050	.....	.....	Elastic limit.
13,250	53,000	.001967	.00015(	.....	.....	
13,500	54,000	.002250	.000283	.....	.....	
13,750	55,000	.002500	.000250	.....	.....	
14,000	56,000	.003167	.000667	.....	.....	
14,250	57,000	.003667	.000500	.....	.....	
14,500	58,000	.004167	.000500	.....	.....	
14,750	59,000	.004667	.000500	.....	.....	
15,000	60,000	.005283	.000616	.....	.....	
15,500	62,000	.006500	.001217	.....	.....	
16,000	64,000	.007800	.001300	.....	.....	
16,500	66,000	.009083	.001283	.....	.....	
17,000	68,000	.010333	.001250	.....	.....	
17,500	70,000	.011667	.001334	.....	.....	
18,000	72,000	.013100	.001433	.....	.....	
18,500	74,000	.014583	.001483	.....	.....	
19,000	76,000	.016083	.001500	.....	.....	
19,500	78,000	.017567	.001484	.....	.....	
20,000	80,000	.019167	.001600	.....	.....	
20,500	82,000	.020917	.001750	.....	.....	
21,000	84,000	.022917	.002000	.....	.....	
21,500	86,000	.024833	.001916	.....	.....	
22,000	88,000	.027000	.002167	.....	.....	
22,500	90,000	.029333	.002333	.....	.....	
23,000	92,000	.0317	.002367	.....	.....	
23,500	94,000	.0350	.0033	.....	.....	
24,000	96,000	.0383	.0033	.....	.....	
24,500	98,000	.0417	.0034	.....	.....	
25,000	100,000	.0467	.0050	.....	.....	
25,500	102,000	.0517	.0050	.....	.....	
26,000	104,000	.0583	.0066	.....	.....	
26,500	106,000	.0683	.0100	.....	.....	
27,000	108,000	.0883	.0200	.....	.....	
27,050	108,200	.1017	.0134	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	108,200
Elastic limit per square inch of original section	do...	52,000
Elongation per inch after rupture	inch..	0.1167
Elongation per inch under strain at elastic limit	do...	.001817
Reduction in diameter at point of rupture	do...	.094
Reduction in area after rupture, per centum of original section		30.6
Position of rupture		3¼ inches from neck
Character of broken surface		granular; silky center
Elongation of inch sections		".09, ".11, ".20*, ".13, ".07, ".08

No. 2754.

Marks, $\frac{10\ T_1\ C_6}{M\ T_2\ O}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000283	.000166	0.	.....	
3,750	15,000	.000450	.000167	0.	.....	
5,000	20,000	.000633	.000183	0.	.....	
6,250	25,000	.000800	.000167	0.	.....	
7,500	30,000	.000983	.000183	0.	.....	
8,750	35,000	.001150	.000167	0.	.....	
10,000	40,000	.001317	.000167	0.	.....	
11,250	45,000	.001483	.000166	.....	.....	
12,500	50,000	.001650	.000167	.....	.....	
12,750	51,000	.001717	.000067	.....	.....	
13,000	52,000	.001783	.000066	.....	.....	
13,250	53,000	.001817	.000034	.....	.....	Elastic limit.
13,500	54,000	.001917	.000100	.....	.....	
13,750	55,000	.002017	.000100	.....	.....	
14,000	56,000	.002133	.000116	.....	.....	
14,250	57,000	.002600	.000467	.....	.....	
14,500	58,000	.003033	.000433	.....	.....	
14,750	59,000	.003367	.000333	.....	.....	
15,000	60,000	.003917	.000550	.....	.....	
15,500	62,000	.005133	.001216	.....	.....	
16,000	64,000	.006333	.001200	.....	.....	
16,500	66,000	.007567	.001234	.....	.....	
17,000	68,000	.008783	.001216	.....	.....	
17,500	70,000	.010083	.001300	.....	.....	
18,000	72,000	.011500	.001417	.....	.....	
18,500	74,000	.012833	.001333	.....	.....	
19,000	76,000	.014167	.001334	.....	.....	
19,500	78,000	.015667	.001500	.....	.....	
20,000	80,000	.017167	.001500	.....	.....	
20,500	82,000	.018667	.001500	.....	.....	
21,000	84,000	.020433	.001766	.....	.....	
21,500	86,000	.022133	.001700	.....	.....	
22,000	88,000	.023833	.001700	.....	.....	
22,500	90,000	.025833	.002000	.....	.....	
23,000	92,000	.028267	.002434	.....	.....	
23,500	94,000	.030833	.002566	.....	.....	
24,000	96,000	.0333	.002467	.....	.....	
24,500	98,000	.0367	.0034	.....	.....	
25,000	100,000	.0383	.0016	.....	.....	
25,500	102,000	.0450	.0067	.....	.....	
26,000	104,000	.0500	.0050	.....	.....	
26,500	106,000	.0550	.0050	.....	.....	
27,000	108,000	.0650	.0100	.....	.....	
27,500	110,000	.0833	.0183	.....	.....	
27,680	110,720	.1017	.0184	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	110,720
Elastic limit per square inch of original section	do...	53,000
Elongation per inch after rupture	inch..	0.1283
Elongation per inch under strain at elastic limit	do...	.001817
Reduction in diameter at point of rupture	do...	.034
Reduction in area after rupture, per centum of original section		30.6
Position of rupture		2".65 from neck
Character of broken surface		granular; silky center
Elongation of inch sections		".09, ".14, ".27*, ".13, ".08, ".06

No. 2755.

Marks, $\frac{10\ R_1\ C_6}{M\ T_2\ M}$
Diameter ".564.
Sectional area, .25 square inch.

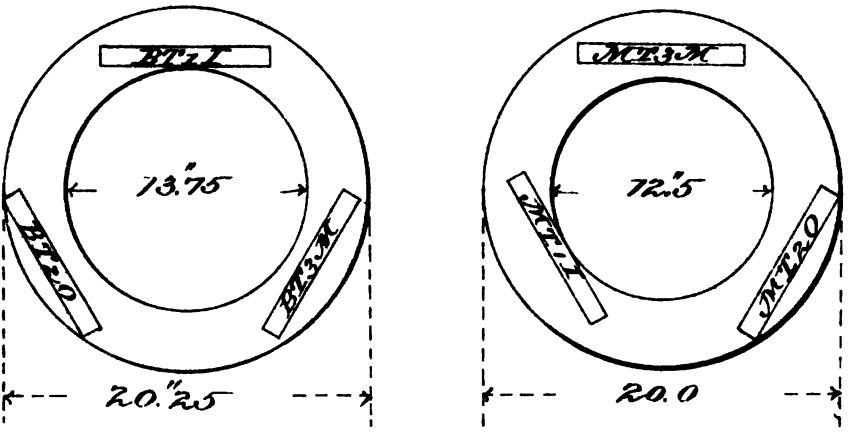
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000300	.000167	0.	.....	
3,750	15,000	.000467	.000167	0.	.....	
5,000	20,000	.000633	.000166	0.	.....	
6,250	25,000	.000800	.000167	0.	.....	
7,500	30,000	.000967	.000167	0.	.....	
8,750	35,000	.001133	.000166	0.	.....	
10,000	40,000	.001300	.000167	0.	.....	
11,250	45,000	.001467	.000167	.....	.....	
12,500	50,000	.001683	.000116	.....	.....	
12,750	51,000	.001717	.000034	.....	.....	Elastic limit.
13,000	52,000	.001833	.000116	.....	.....	
13,250	53,000	.001950	.000117	.....	.....	
13,500	54,000	.002233	.000283	.....	.....	
13,750	55,000	.002517	.000284	.....	.....	
14,000	56,000	.002850	.000333	.....	.....	
14,250	57,000	.003333	.000483	.....	.....	
14,500	58,000	.003917	.000584	.....	.....	
14,750	59,000	.004467	.000550	.....	.....	
15,000	60,000	.005050	.000583	.....	.....	
15,500	62,000	.006217	.001167	.....	.....	
16,000	64,000	.007450	.001233	.....	.....	
16,500	66,000	.008750	.001300	.....	.....	
17,000	68,000	.010083	.001333	.....	.....	
17,500	70,000	.011333	.001250	.....	.....	
18,000	72,000	.012583	.001250	.....	.....	
18,500	74,000	.014083	.001500	.....	.....	
19,000	76,000	.015667	.001583	.....	.....	
19,500	78,000	.017083	.001416	.....	.....	
20,000	80,000	.018750	.001667	.....	.....	
20,500	82,000	.020400	.001650	.....	.....	
21,000	84,000	.022050	.001650	.....	.....	
21,500	86,000	.023950	.001900	.....	.....	
22,000	88,000	.026083	.002133	.....	.....	
22,500	90,000	.028333	.002250	.....	.....	
23,000	92,000	.0317	.003367	.....	.....	
23,500	94,000	.0350	.0033	.....	.....	
24,000	96,000	.0367	.0017	.....	.....	
24,500	98,000	.0383	.0016	.....	.....	
25,000	100,000	.0450	.0067	.....	.....	
25,500	102,000	.0500	.0050	.....	.....	
26,000	104,000	.0550	.0050	.....	.....	
26,500	106,000	.0650	.0100	.....	.....	
27,000	108,000	.0783	.0133	.....	.....	
27,310	109,240	.1000	.0217	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	109,240
Elastic limit per square inch of original section	do...	51,000
Elongation per inch after rupture	inch..	0.1167
Elongation per inch under strain at elastic limit	do...	.001717
Reduction in diameter at point of rupture	do...	.084
Reduction in area after rupture, per centum of original section		27.6
Position of rupture		at middle of stem
Character of broken surface		granular; silky center
Elongation of inch sections		".07, ".09, ".20*, ".15, ".10, ".09

10" Steel B.L. Rifle No.1

Hoop C7



H Ex 31 49 2

No. 2756.

Marks, $\frac{10\ R,\ C_7}{B\ T,\ I}$
Diameter, ".564.
Sectional area, .25 square inch.

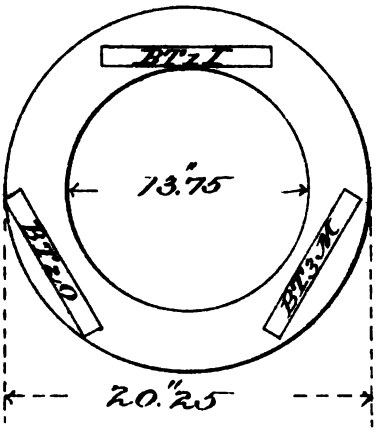
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000283	.000166	0.	.....	
3,750	15,000	.000450	.000167	0.	.....	
5,000	20,000	.000600	.000150	0.	.....	
6,250	25,000	.000767	.000167	0.	.....	
7,500	30,000	.000950	.000183	0.	.....	
8,750	35,000	.001133	.000183	0.	.....	
10,000	40,000	.001300	.000167	0.	.....	
11,250	45,000	.001467	.000167	.....	.....	
12,500	50,000	.001633	.000166	.....	.....	
12,750	51,000	.001667	.000034	.....	.....	
13,000	52,000	.001683	.000016	.....	.....	
13,250	53,000	.001717	.000034	.....	.....	
13,500	54,000	.001783	.000066	.....	.....	
13,750	55,000	.001817	.000034	.....	.....	
14,000	56,000	.001867	.000050	.....	.....	
14,250	57,000	.001900	.000033	.....	.....	Elastic limit.
14,500	58,000	.002000	.000100	.....	.....	
14,750	59,000	.002083	.000083	.....	.....	
15,000	60,000	.002217	.000134	.....	.....	
15,500	62,000	.002633	.000416	.....	.....	
16,000	64,000	.003417	.000784	.....	.....	
16,500	66,000	.004750	.001333	.....	.....	
17,000	68,000	.006083	.001333	.....	.....	
17,500	70,000	.007583	.001500	.....	.....	
18,000	72,000	.009083	.001500	.....	.....	
18,500	74,000	.010367	.001284	.....	.....	
19,000	76,000	.011867	.001500	.....	.....	
19,500	78,000	.013650	.001783	.....	.....	
20,000	80,000	.015167	.001517	.....	.....	
20,500	82,000	.016667	.001500	.....	.....	
21,000	84,000	.018183	.001516	.....	.....	
21,500	86,000	.020167	.001984	.....	.....	
22,000	88,000	.022167	.002000	.....	.....	
22,500	90,000	.024100	.001933	.....	.....	
23,000	92,000	.026217	.002117	.....	.....	
23,500	94,000	.0283	.002083	.....	.....	
24,000	96,000	.0317	.0034	.....	.....	
24,500	98,000	.0350	.0033	.....	.....	
25,000	100,000	.0383	.0033	.....	.....	
25,500	102,000	.0417	.0034	.....	.....	
26,000	104,000	.0467	.0050	.....	.....	
26,500	106,000	.0517	.0050	.....	.....	
27,000	108,000	.0600	.0083	.....	.....	
27,500	110,000	.0717	.0117	.....	.....	
27,790	111,160	.0917	.0200	.....	.....	Tensile strength.

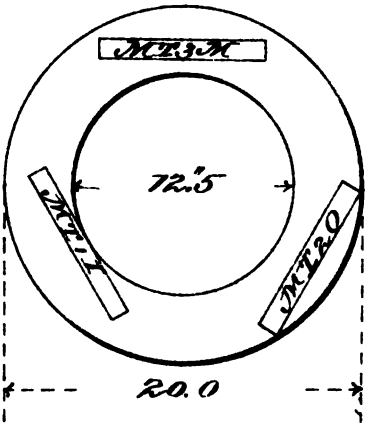
General summary.

Tensile strength per square inch of original section	pounds..	111,160
Elastic limit per square inch of original section	do...	57,000
Elongation per inch after rupture	inch..	0.0950
Elongation per inch under strain at elastic limit	do...	.001900
Reduction in diameter at point of rupture	do...	.054
Reduction in area after rupture, per centum of original section		18.3
Position of rupture		".70 from neck
Character of broken surface	granular; radiating from a dull spot at circumference	
Elongation of inch sections	".18", ".09, ".08, ".07, ".07, ".08	

10" Steel B.L. Rifle No.1

Hoop C7





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No. 2756.

Marks, $\frac{10\ R,\ C_7}{B\ T,\ I}$
Diameter, ".564.
Sectional area, .25 square inch.

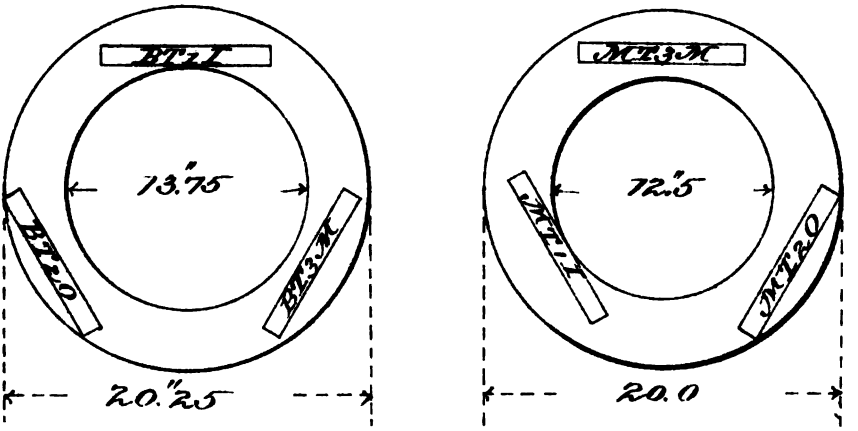
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000283	.000166	0.	.....	
3,750	15,000	.000450	.000167	0.	.....	
5,000	20,000	.000600	.000150	0.	.....	
6,250	25,000	.000767	.000167	0.	.....	
7,500	30,000	.000950	.000183	0.	.....	
8,750	35,000	.001133	.000183	0.	.....	
10,000	40,000	.001300	.000167	0.	.....	
11,250	45,000	.001467	.000167	.....	.....	
12,500	50,000	.001633	.000166	.....	.....	
12,750	51,000	.001667	.000034	.....	.....	
13,000	52,000	.001683	.000016	.....	.....	
13,250	53,000	.001717	.000034	.....	.....	
13,500	54,000	.001783	.000066	.....	.....	
13,750	55,000	.001817	.000034	.....	.....	
14,000	56,000	.001867	.000050	.....	.....	
14,250	57,000	.001900	.000033	.....	.....	Elastic limit.
14,500	58,000	.002000	.000100	.....	.....	
14,750	59,000	.002083	.000083	.....	.....	
15,000	60,000	.002217	.000134	.....	.....	
15,500	62,000	.002633	.000416	.....	.....	
16,000	64,000	.003417	.000784	.....	.....	
16,500	66,000	.004750	.001333	.....	.....	
17,000	68,000	.006083	.001333	.....	.....	
17,500	70,000	.007583	.001500	.....	.....	
18,000	72,000	.009083	.001500	.....	.....	
18,500	74,000	.010367	.001284	.....	.....	
19,000	76,000	.011867	.001500	.....	.....	
19,500	78,000	.013650	.001783	.....	.....	
20,000	80,000	.015167	.001517	.....	.....	
20,500	82,000	.016667	.001500	.....	.....	
21,000	84,000	.018183	.001516	.....	.....	
21,500	86,000	.020167	.001984	.....	.....	
22,000	88,000	.022167	.002000	.....	.....	
22,500	90,000	.024100	.001933	.....	.....	
23,000	92,000	.026217	.002117	.....	.....	
23,500	94,000	.0283	.002083	.....	.....	
24,000	96,000	.0317	.0034	.....	.....	
24,500	98,000	.0350	.0033	.....	.....	
25,000	100,000	.0383	.0033	.....	.....	
25,500	102,000	.0417	.0034	.....	.....	
26,000	104,000	.0467	.0050	.....	.....	
26,500	106,000	.0517	.0050	.....	.....	
27,000	108,000	.0600	.0083	.....	.....	
27,500	110,000	.0717	.0117	.....	.....	
27,790	111,160	.0917	.0200	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	111,160
Elastic limit per square inch of original section	do...	57,000
Elongation per inch after rupture	inch..	0.0950
Elongation per inch under strain at elastic limit	do...	.001900
Reduction in diameter at point of rupture	do...	.054
Reduction in area after rupture, per centum of original section		18.3
Position of rupture		".70 from neck
Character of broken surface	granular; radiating from a dull spot at circumference	
Elongation of inch sections	".18', ".09, ".08, ".07, ".07, ".08	

10" Steel B.L. Rifle No.1

Hoop C7



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No. 2756.

Marks, $\overset{10\ R,\ C_7}{B\ T,\ I}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.		
2,500	10,000	.000283	.000166	0.		
3,750	15,000	.000450	.000167	0.		
5,000	20,000	.000600	.000150	0.		
6,250	25,000	.000767	.000167	0.		
7,500	30,000	.000950	.000183	0.		
8,750	35,000	.001133	.000183	0.		
10,000	40,000	.001300	.000167	0.		
11,250	45,000	.001467	.000167			
12,500	50,000	.001633	.000166			
12,750	51,000	.001667	.000034			
13,000	52,000	.001683	.000016			
13,250	53,000	.001717	.000034			
13,500	54,000	.001783	.000066			
13,750	55,000	.001817	.000034			
14,000	56,000	.001867	.000050			
14,250	57,000	.001900	.000033			Elastic limit.
14,500	58,000	.002000	.000100			
14,750	59,000	.002083	.000083			
15,000	60,000	.002217	.000134			
15,500	62,000	.002633	.000416			
16,000	64,000	.003417	.000784			
16,500	66,000	.004750	.001333			
17,000	68,000	.006083	.001333			
17,500	70,000	.007583	.001500			
18,000	72,000	.009083	.001500			
18,500	74,000	.010367	.001284			
19,000	76,000	.011867	.001500			
19,500	78,000	.013650	.001783			
20,000	80,000	.015167	.001517			
20,500	82,000	.016667	.001500			
21,000	84,000	.018183	.001516			
21,500	86,000	.020167	.001984			
22,000	88,000	.022167	.002000			
22,500	90,000	.024100	.001933			
23,000	92,000	.026217	.002117			
23,500	94,000	.0283	.002083			
24,000	96,000	.0317	.0034			
24,500	98,000	.0350	.0033			
25,000	100,000	.0383	.0033			
25,500	102,000	.0417	.0034			
26,000	104,000	.0467	.0050			
26,500	106,000	.0517	.0050			
27,000	108,000	.0600	.0083			
27,500	110,000	.0717	.0117			
27,790	111,160	.0917	.0200			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	111,160
Elastic limit per square inch of original section	do...	57,000
Elongation per inch after rupture	inch..	0.0950
Elongation per inch under strain at elastic limit	do...	.001900
Reduction in diameter at point of rupture	do...	.054
Reduction in area after rupture, per centum of original section		18.3
Position of rupture		".70 from neck
Character of broken surface	granular; radiating from a dull spot at circumference	
Elongation of inch sections	".18", ".09, ".08, ".07, ".07, ".08	

No. 2757.

Marks, $\overset{10}{B}\ \overset{R_1}{T}\ \overset{C_7}{O}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000283	.000166	0.	.....	
3,750	15,000	.000450	.000167	0.	.....	
5,000	20,000	.000617	.000167	0.	.....	
6,250	25,000	.000783	.000166	0.	.....	
7,500	30,000	.000950	.000167	0.	.....	
8,750	35,000	.001117	.000167	0.	.....	
10,000	40,000	.001283	.000166	0.	.....	
11,250	45,000	.001450	.000167	.....	.....	
12,500	50,000	.001633	.000183	.....	.....	
12,750	51,000	.001667	.000034	.....	.....	
13,000	52,000	.001700	.000033	.....	.....	
13,250	53,000	.001733	.000033	.....	.....	
13,500	54,000	.001783	.000050	.....	.....	
13,750	55,000	.001817	.000034	.....	.....	Elastic limit.
14,000	56,000	.001933	.000116	.....	.....	
14,250	57,000	.002000	.000067	.....	.....	
14,500	58,000	.002117	.000117	.....	.....	
14,750	59,000	.002250	.000133	.....	.....	
15,000	60,000	.002667	.000417	.....	.....	
15,500	62,000	.003350	.000683	.....	.....	
16,000	64,000	.004350	.001000	.....	.....	
16,500	66,000	.005533	.001183	.....	.....	
17,000	68,000	.006917	.001384	.....	.....	
17,500	70,000	.008167	.001250	.....	.....	
18,000	72,000	.009583	.001416	.....	.....	
18,500	74,000	.011000	.001417	.....	.....	
19,000	76,000	.012000	.001000	.....	.....	
19,500	78,000	.013917	.001917	.....	.....	
20,000	80,000	.015083	.001166	.....	.....	
20,500	82,000	.016833	.001750	.....	.....	
21,000	84,000	.018417	.001584	.....	.....	
21,500	86,000	.020250	.001833	.....	.....	
22,000	88,000	.022083	.001833	.....	.....	
22,500	90,000	.024167	.002084	.....	.....	
23,000	92,000	.025967	.001800	.....	.....	
23,500	94,000	.0283	.002333	.....	.....	
24,000	96,000	.0317	.0034	.....	.....	
24,500	98,000	.0333	.0016	.....	.....	
25,000	100,000	.0367	.0034	.....	.....	
25,500	102,000	.0400	.0033	.....	.....	
26,000	104,000	.0450	.0050	.....	.....	
26,500	106,000	.0500	.0050	.....	.....	
27,000	108,000	.0550	.0050	.....	.....	
27,500	110,000	.0650	.0100	.....	.....	
28,000	112,000	.0850	.0200	.....	.....	
28,120	112,480	.1033	.0183	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	112,480
Elastic limit per square inch of original section	do...	55,000
Elongation per inch after rupture	inch..	0.1300
Elongation per inch under strain at elastic limit	do...	.001817
Reduction in diameter at point of rupture	do...	.084
Reduction in area after rupture, per centum of original section		27.6
Position of rupture		at middle of stem
Character of broken surface		granular; silky center
Elongation of inch sections		".08, ".11, ".19*, ".21*, ".11, ".08

No. 2758.

Marks, $\frac{10\,R;\,C,}{B\,T;\,M}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	.....	
2,500	10,000	.000317	.000167	0.	.....	
3,750	15,000	.000467	.000150	0.	.....	
5,000	20,000	.000633	.000166	0.	.....	
6,250	25,000	.000800	.000167	0.	.....	
7,500	30,000	.000967	.000167	0.	.....	
8,750	35,000	.001133	.000166	0.	.....	
10,000	40,000	.001300	.000167	0.	.....	
11,250	45,000	.001467	.000167	.....	.....	
12,500	50,000	.001667	.000200	.....	.....	
12,750	51,000	.001717	.000050	.....	.....	
13,000	52,000	.001750	.000033	.....	.....	
13,250	53,000	.001783	.000033	.....	.....	
13,500	54,000	.001800	.000017	.....	.....	
13,750	55,000	.001850	.000050	.....	.....	
14,000	56,000	.001933	.000083	.....	.....	
14,250	57,000	.001983	.000050	.....	.....	Elastic limit.
14,500	58,000	.002100	.000117	.....	.....	
14,750	59,000	.002250	.000150	.....	.....	
15,000	60,000	.002450	.000200	.....	.....	
15,500	62,000	.003067	.000617	.....	.....	
16,000	64,000	.004000	.000933	.....	.....	
16,500	66,000	.005167	.001167	.....	.....	
17,000	68,000	.006583	.001416	.....	.....	
17,500	70,000	.007833	.001250	.....	.....	
18,000	72,000	.009333	.001500	.....	.....	
18,500	74,000	.010617	.001284	.....	.....	
19,000	76,000	.012083	.001466	.....	.....	
19,500	78,000	.013533	.001450	.....	.....	
20,000	80,000	.014850	.001317	.....	.....	
20,500	82,000	.016500	.001650	.....	.....	
21,000	84,000	.018167	.001667	.....	.....	
21,500	86,000	.020000	.001833	.....	.....	
22,000	88,000	.022083	.002083	.....	.....	
22,500	90,000	.023833	.001750	.....	.....	
23,000	92,000	.026167	.002334	.....	.....	
23,500	94,000	.028333	.002166	.....	.....	
24,000	96,000	.030833	.002500	.....	.....	
24,500	98,000	.033750	.002917	.....	.....	
25,000	100,000	.0367	.002950	.....	.....	
25,500	102,000	.0400	.0033	.....	.....	
26,000	104,000	.0450	.0050	.....	.....	
26,500	106,000	.0500	.0050	.....	.....	
27,000	108,000	.0567	.0067	.....	.....	
27,500	110,000	.0667	.0100	.....	.....	
28,000	112,000	.0833	.0166	.....	.....	
28,030	112,120	.0950	.0117	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	112,120
Elastic limit per square inch of original section	do...	57,000
Elongation per inch after rupture	inch..	0.0967
Elongation per inch under strain at elastic limit	do...	.001983
Reduction in diameter at point of rupture	do...	.074
Reduction in area after rupture, per centum of original section		24.6
Position of rupture		½ inch from neck
Character of broken surface		granular; dull spot at circumference
Elongation of inch sections		".07, ".07, ".07, ".08, ".10, ".19*

No. 2759.

Marks, $\frac{10\ R,\ C}{M\ T,\ I}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000267	.000150	0.	.....	
3,750	15,000	.000450	.000183	0.	.....	
5,000	20,000	.000617	.000167	0.	.....	
6,250	25,000	.000767	.000150	0.	.....	
7,500	30,000	.000933	.000166	0.	.....	
8,750	35,000	.001117	.000184	0.	.....	
10,000	40,000	.001300	.000183	0.	.....	
11,250	45,000	.001450	.000150	.....	.....	
12,500	50,000	.001633	.000183	.....	.....	
12,750	51,000	.001667	.000034	.....	.....	
13,000	52,000	.001700	.000033	.....	.....	
13,250	53,000	.001733	.000033	.....	.....	
13,500	54,000	.001767	.000034	.....	.....	
13,750	55,000	.001817	.000050	.....	.....	Elastic limit.
14,000	56,000	.001900	.000083	.....	.....	
14,250	57,000	.001983	.000083	.....	.....	
15,500	58,000	.002100	.000117	.....	.....	
14,750	59,000	.002217	.000117	.....	.....	
15,000	60,000	.002467	.000250	.....	.....	
15,500	62,000	.003000	.000533	.....	.....	
16,000	64,000	.003833	.000833	.....	.....	
16,500	66,000	.004917	.001084	.....	.....	
17,000	68,000	.006167	.001250	.....	.....	
17,500	70,000	.007533	.001366	.....	.....	
18,000	72,000	.009000	.001467	.....	.....	
18,500	74,000	.010283	.001283	.....	.....	
19,000	76,000	.011750	.001467	.....	.....	
19,500	78,000	.013167	.001417	.....	.....	
20,000	80,000	.014750	.001583	.....	.....	
20,500	82,000	.016500	.001750	.....	.....	
21,000	84,000	.018000	.001500	.....	.....	
21,500	86,000	.019700	.001700	.....	.....	
22,000	88,000	.021667	.001967	.....	.....	
22,500	90,000	.023667	.002000	.....	.....	
23,000	92,000	.025833	.002166	.....	.....	
23,500	94,000	.027833	.002000	.....	.....	
24,000	96,000	.030167	.002334	.....	.....	
24,500	98,000	.0333	.003133	.....	.....	
25,000	100,000	.0367	.0034	.....	.....	
25,500	102,000	.0400	.0033	.....	.....	
26,000	104,000	.0450	.0050	.....	.....	
26,500	106,000	.0500	.0050	.....	.....	
27,000	108,000	.0550	.0050	.....	.....	
27,500	110,000	.0650	.0100	.....	.....	
27,800	111,200	.0900	.0250	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	111,200
Elastic limit per square inch of original section	do...	55,000
Elongation per inch after rupture	inch..	0.0900
Elongation per inch under strain at elastic limit	do..	.001817
Reduction in diameter at point of rupture	do..	.064
Reduction in area after rupture, per centum of original section		21.4
Position of rupture		".45 from neck
Character of broken surface		granular; silky center
Elongation of inch sections		".05, ".05 ".06 ".06 ".08, ".24*

No. 2760.

Marks, $\frac{10\ R_1\ C_7}{M\ T_2\ O}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000283	.000166	0.	.....	
3,750	15,000	.000450	.000167	0.	.....	
5,000	20,000	.000600	.000150	0.	.....	
6,250	25,000	.000767	.000167	0.	.....	
7,500	30,000	.000933	.000166	0.	.....	
8,750	35,000	.001117	.000184	0.	.....	
10,000	40,000	.001283	.000166	0.	.....	
11,250	45,000	.001450	.000167	.....	.....	
12,500	50,000	.001633	.000183	.....	.....	
12,750	51,000	.001683	.000050	.....	.....	Elastic limit.
13,000	52,000	.001783	.000100	.....	.....	
13,250	53,000	.001950	.000167	.....	.....	
13,500	54,000	.002467	.000517	.....	.....	
13,750	55,000	.002800	.000333	.....	.....	
14,000	56,000	.003367	.000567	.....	.....	
14,250	57,000	.003883	.000516	.....	.....	
14,500	58,000	.004500	.000617	.....	.....	
14,750	59,000	.005067	.000567	.....	.....	
15,000	60,000	.005833	.000766	.....	.....	
15,500	62,000	.006950	.001117	.....	.....	
16,000	64,000	.008333	.001383	.....	.....	
16,500	66,000	.009583	.001250	.....	.....	
17,000	68,000	.010917	.001334	.....	.....	
17,500	70,000	.012667	.001750	.....	.....	
18,000	72,000	.014167	.001500	.....	.....	
18,500	74,000	.015583	.001416	.....	.....	
19,000	76,000	.017100	.001517	.....	.....	
19,500	78,000	.018750	.001650	.....	.....	
20,000	80,000	.020783	.002033	.....	.....	
20,500	82,000	.022667	.001884	.....	.....	
21,000	84,000	.024833	.002166	.....	.....	
21,500	86,000	.026833	.002000	.....	.....	
22,000	88,000	.0300	.003167	.....	.....	
22,500	90,000	.0317	.0017	.....	.....	
23,000	92,000	.0350	.0033	.....	.....	
23,500	94,000	.0383	.0033	.....	.....	
24,000	96,000	.0417	.0034	.....	.....	
24,500	98,000	.0467	.0050	.....	.....	
25,000	100,000	.0517	.0050	.....	.....	
25,500	102,000	.0567	.0050	.....	.....	
26,000	104,000	.0683	.0116	.....	.....	
26,500	106,000	.0833	.0150	.....	.....	
26,860	107,440	.1167	.0334	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	107,440
Elastic limit per square inch of original section	do...	51,000
Elongation per inch after rupture	inch..	0.1417
Elongation per inch under strain at elastic limit	do...	.001683
Reduction in diameter at point of rupture	do...	.084
Reduction in area after rupture, per centum of original section		27.6
Position of rupture		2¼ inches from neck
Character of broken surface		granular; silky spot near center
Elongation of inch sections		.09, ".22*, ".23*, ".15, ".10, ".06

No. 2761.

Marks, $\frac{10\ R_1\ C_7}{M\ T_2\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.

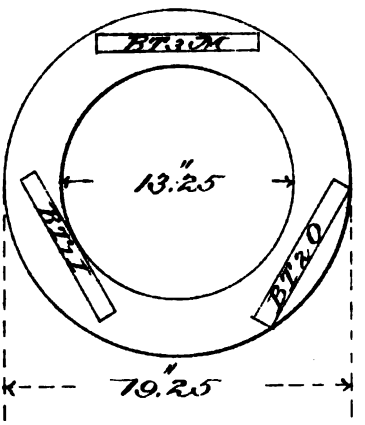
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000300	.000167	0.	.....	
3,750	15,000	.000467	.000167	0.	.....	
5,000	20,000	.000650	.000183	0.	.....	
6,250	25,000	.000817	.000167	0.	.....	
7,500	30,000	.000983	.000166	0.	.....	
8,750	35,000	.001150	.000167	0.	.....	
10,000	40,000	.001317	.000167	.000017	.000017	
11,250	45,000	.001483	.000166	.....	.....	
12,500	50,000	.001667	.000184	.....	.....	
12,750	51,000	.001700	.000033	.....	.....	
13,000	52,000	.001750	.000050	.....	.....	
13,250	53,000	.001783	.000033	.....	.....	Elastic limit.
13,500	54,000	.001900	.000117	.....	.....	
13,750	55,000	.002050	.000150	.....	.....	
14,000	56,000	.002467	.000417	.....	.....	
14,250	57,000	.002833	.000366	.....	.....	
14,500	58,000	.003500	.000667	.....	.....	
14,750	59,000	.004017	.000517	.....	.....	
15,000	60,000	.004850	.000833	.....	.....	
15,500	62,000	.006083	.001233	.....	.....	
16,000	64,000	.007667	.001584	.....	.....	
16,500	66,000	.009583	.001916	.....	.....	
17,000	68,000	.010500	.000917	.....	.....	
17,500	70,000	.011833	.001333	.....	.....	
18,000	72,000	.013300	.001467	.....	.....	
18,500	74,000	.014833	.001533	.....	.....	
19,000	76,000	.016417	.001584	.....	.....	
19,500	78,000	.018083	.001666	.....	.....	
20,000	80,000	.020000	.001917	.....	.....	
20,500	82,000	.021833	.001833	.....	.....	
21,000	84,000	.024000	.002167	.....	.....	
21,500	86,000	.026250	.002250	.....	.....	
22,000	88,000	.028583	.002333	.....	.....	
22,500	90,000	.030833	.002250	.....	.....	
23,000	92,000	.0333	.002467	.....	.....	
23,500	94,000	.0367	.0034	.....	.....	
24,000	96,000	.0400	.0033	.....	.....	
24,500	98,000	.0467	.0067	.....	.....	
25,000	100,000	.0517	.0050	.....	.....	
25,500	102,000	.0567	.0050	.....	.....	
26,000	104,000	.0667	.0100	.....	.....	
26,500	106,000	.0850	.0183	.....	.....	
26,610	106,440	.1050	.0200	.....	.....	Tensile strength.

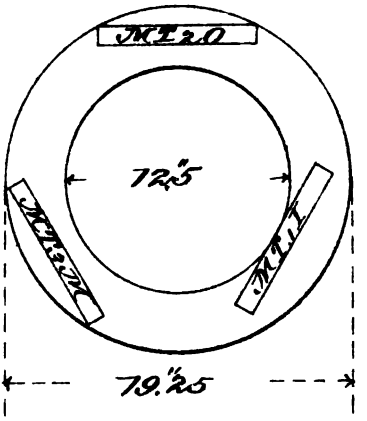
General summary.

Tensile strength per square inch of original section	pounds..	106,440
Elastic limit per square inch of original section	do...	53,000
Elongation per inch after rupture	inch..	0.1200
Elongation per inch under strain at elastic limit	do...	.001783
Reduction in diameter at point of rupture	do...	.094
Reduction in area after rupture, per centum of original section		30.6
Position of rupture		″.80 from neck
Character of broken surface		granular; silky eccentric spot
Elongation of inch sections		″.25*, ″.14, ″.09, ″.08, ″.08, ″.08

10" Steel B.L. Rifle No. 1

Hoop C8





H Ex 31 49 2

No. 2683.

Marks, $\frac{10\ R_1\ C_2}{B\ T_1\ I}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.		
2,500	10,000	.000317	.000167	0.		
3,750	15,000	.000483	.000166	0.		
5,000	20,000	.000650	.000167	0.		
6,250	25,000	.000833	.000183	0.		
7,500	30,000	.001000	.000167	0.		
8,750	35,000	.001167	.000167	0.		
10,000	40,000	.001333	.000166	0.		
11,250	45,000	.001483	.000150			
12,500	50,000	.001650	.000167			
12,750	51,000	.001683	.000033			
13,000	52,000	.001733	.000050			
13,250	53,000	.001767	.000034			
13,500	54,000	.001783	.000016			
13,750	55,000	.001850	.000067			
14,000	56,000	.001883	.000033			
14,250	57,000	.001950	.000067			Elastic limit.
14,500	58,000	.002117	.000167			
14,750	59,000	.002300	.000183			
15,000	60,000	.002567	.000267			
15,500	62,000	.003233	.000666			
16,000	64,000	.004000	.000767			
16,500	66,000	.005117	.001117			
17,000	68,000	.006833	.001716			
17,500	70,000	.008267	.001434			
18,000	72,000	.009838	.001566			
18,500	74,000	.011417	.001584			
19,000	76,000	.012833	.001416			
19,500	78,000	.014833	.002000			
20,000	80,000	.016500	.001667			
20,500	82,000	.018083	.001583			
21,000	84,000	.019667	.001584			
21,500	86,000	.021417	.001750			
22,000	88,000	.023333	.001916			
22,500	90,000	.025667	.002334			
23,000	92,000	.0275	.001833			
23,500	94,000	.0300	.0025			
24,000	96,000	.0333	.0033			
24,500	98,000	.0367	.0034			
25,000	100,000	.0400	.0033			
25,500	102,000	.0450	.0050			
26,000	104,000	.0500	.0050			
26,500	106,000	.0583	.0083			
27,000	108,000	.0700	.0117			
27,415	109,660	.0907	.0267			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	109,660
Elastic limit per square inch of original section	do...	57,000
Elongation per inch after rupture	inch..	0.1133
Elongation per inch under strain at elastic limit	do...	.001950
Reduction in diameter at point of rupture	do...	.104
Reduction in area after rupture, per centum of original section		33.5
Position of rupture		1″.17 from neck
Character of broken surface		granular; silky center
Elongation of inch sections		″.07, ″.07, ″.07, ″.08, ″.08, ″.21*

No. 2684.

Marks, $\frac{10\ R_1\ C_3}{B\ T_2\ O}$
Diameter, ″.565.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000300	.000167	0.	.....	
3,750	15,000	.000467	.000167	0.	.....	
5,000	20,000	.000633	.000166	0.	.....	
6,250	25,000	.000800	.000167	0.	.....	
7,500	30,000	.000967	.000167	0.	.....	
8,750	35,000	.001133	.000166	0.	.....	
10,000	40,000	.001300	.000167	0.	.....	
11,250	45,000	.001467	.000167	.....	.....	
12,500	50,000	.001633	.000166	.....	.....	
12,750	51,000	.001667	.000034	.....	.....	
13,000	52,000	.001717	.000050	.....	.....	
13,250	53,000	.001750	.000033	.....	.....	
13,500	54,000	.001800	.000050	.....	.....	Elastic limit.
13,750	55,000	.002000	.000200	.....	.....	
14,000	56,000	.002383	.000383	.....	.....	
14,250	57,000	.002833	.000450	.....	.....	
14,500	58,000	.003533	.000700	.....	.....	
14,750	59,000	.004100	.000567	.....	.....	
15,000	60,000	.004933	.000833	.....	.....	
15,500	62,000	.006417	.001484	.....	.....	
16,000	64,000	.007833	.001416	.....	.....	
16,500	66,000	.009350	.001517	.....	.....	
17,000	68,000	.010667	.001317	.....	.....	
17,500	70,000	.012250	.001583	.....	.....	
18,000	72,000	.013667	.001417	.....	.....	
18,500	74,000	.015283	.001616	.....	.....	
19,000	76,000	.016833	.001550	.....	.....	
19,500	78,000	.018550	.001717	.....	.....	
20,000	80,000	.020500	.001950	.....	.....	
20,500	82,000	.022583	.002083	.....	.....	
21,000	84,000	.024500	.001917	.....	.....	
21,500	86,000	.026783	.002283	.....	.....	
22,000	88,000	.0300	.006217	.....	.....	
22,500	90,000	.0333	.0033	.....	.....	
23,000	92,000	.0367	.0034	.....	.....	
23,500	94,000	.0383	.0016	.....	.....	
24,000	96,000	.0433	.0050	.....	.....	
24,500	98,000	.0483	.0050	.....	.....	
25,000	100,000	.0533	.0050	.....	.....	
25,500	102,000	.0633	.0100	.....	.....	
26,000	104,000	.0783	.0150	.....	.....	
26,360	105,440	.1050	.0267	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	105,440
Elastic limit per square inch of original section	do...	54,000
Elongation per inch after rupture	inch..	0.1300
Elongation per inch under strain at elastic limit	do...	.001800
Reduction in diameter at point of rupture	do...	.115
Reduction in area after rupture, per centum of original section		36.4
Position of rupture		1″.22 from neck
Character of broken surface		granular; silky center
Elongation of inch sections		″.06, ″.08, ″.09, ″.10, ″.23*, ″.22

No. 2685.

Marks, $\frac{10\ R_1\ C_8}{B\ T_2\ M}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	.....	
2,500	10,000	.000300	.000150	0.	.....	
3,750	15,000	.000467	.000167	0.	.....	
5,000	20,000	.000633	.000166	0.	.....	
6,250	25,000	.000783	.000150	0.	.....	
7,500	30,000	.000950	.000167	0.	.....	
8,750	35,000	.001117	.000167	0.	.....	
10,000	40,000	.001283	.000166	0.	.....	
11,250	45,000	.001467	.000184	.....	.....	
12,500	50,000	.001650	.000183	.....	.....	
12,750	51,000	.001683	.000033	.....	.....	
13,000	52,000	.001717	.000034	.....	.....	
13,250	53,000	.001767	.000050	.....	.....	
13,500	54,000	.001817	.000050	.....	.....	Elastic limit.
13,750	55,000	.001917	.000100	.....	.....	
14,000	56,000	.002100	.000183	.....	.....	
14,250	57,000	.002333	.000233	.....	.....	
14,500	58,000	.002833	.000500	.....	.....	
14,750	59,000	.003167	.000334	.....	.....	
15,000	60,000	.003867	.000700	.....	.....	
15,500	62,000	.005200	.001333	.....	.....	
16,000	64,000	.006700	.001500	.....	.....	
16,500	66,000	.008183	.001483	.....	.....	
17,000	68,000	.009500	.001317	.....	.....	
17,500	70,000	.010017	.001417	.....	.....	
18,000	72,000	.012333	.001416	.....	.....	
18,500	74,000	.013833	.001500	.....	.....	
19,000	76,000	.015333	.001500	.....	.....	
19,500	78,000	.017000	.001667	.....	.....	
20,000	80,000	.018683	.001683	.....	.....	
20,500	82,000	.020667	.001984	.....	.....	
21,000	84,000	.022450	.001783	.....	.....	
21,500	86,000	.024667	.002217	.....	.....	
22,000	88,000	.026517	.001850	.....	.....	
22,500	90,000	.0283	.001783	.....	.....	
23,000	92,000	.0317	.0034	.....	.....	
23,500	94,000	.0350	.0033	.....	.....	
24,000	96,000	.0367	.0017	.....	.....	
24,500	98,000	.0417	.0050	.....	.....	
25,000	100,000	.0483	.0066	.....	.....	
25,500	102,000	.0533	.0050	.....	.....	
26,000	104,000	.0617	.0084	.....	.....	
26,500	106,000	.0700	.0083	.....	.....	
27,000	108,000	.0950	.0250	.....	.....	
27,060	108,240	.1117	.0167	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	108,240
Elastic limit per square inch of original section	do ..	54,000
Elongation per inch after rupture	inch..	0.1200
Elongation per inch under strain at elastic limit	do...	.001817
Reduction in diameter at point of rupture	do...	.064
Reduction in area after rupture, per centum of original section		21.4
Position of rupture		".65 from neck
Character of broken surface		granular; radiating from a dull spot at the circumference
Elongation of inch sections		".18", ".12, ".10, ".10, ".12

No. 2686.

Marks, $^{10}_{M}\,R_1\,C_2\,T_1\,I$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000317	.000184	0.	.....	
3,750	15,000	.000483	.000166	0.	.....	
5,000	20,000	.000650	.000167	0.	.....	
6,250	25,000	.000817	.000167	0.	.....	
7,500	30,000	.001000	.000183	0.	.....	
8,750	35,000	.001150	.000150	0.	.....	
10,000	40,000	.001333	.000183	0.	.....	
11,250	45,000	.001483	.000150	.....	.....	
12,500	50,000	.001650	.000167	.....	.....	
12,750	51,000	.001683	.000033	.....	.....	
13,000	52,000	.001733	.000050	.....	.....	
13,250	53,000	.001767	.000034	.....	.....	
13,500	54,000	.001817	.000050	.....	.....	
13,750	55,000	.001867	.000050	.....	.....	Elastic limit.
14,000	56,000	.002000	.000133	.....	.....	
14,250	57,000	.002167	.000167	.....	.....	
14,500	58,000	.002433	.000266	.....	.....	
14,750	59,000	.002733	.000300	.....	.....	
15,000	60,000	.003333	.000600	.....	.....	
15,500	62,000	.004833	.001500	.....	.....	
16,000	64,000	.006500	.001667	.....	.....	
16,500	66,000	.008083	.001583	.....	.....	
17,000	68,000	.009583	.001500	.....	.....	
17,500	70,000	.011250	.001667	.....	.....	
18,000	72,000	.012500	.001250	.....	.....	
18,500	74,000	.014117	.001617	.....	.....	
19,000	76,000	.015667	.001550	.....	.....	
19,500	78,000	.017500	.001833	.....	.....	
20,000	80,000	.019267	.001767	.....	.....	
20,500	82,000	.021333	.002066	.....	.....	
21,000	84,000	.023333	.002000	.....	.....	
21,500	86,000	.025333	.002000	.....	.....	
22,000	88,000	.027667	.002334	.....	.....	
22,500	90,000	.0300	.002333	.....	.....	
23,000	92,000	.0333	.0033	.....	.....	
23,500	94,000	.0367	.0034	.....	.....	
24,000	96,000	.0400	.0033	.....	.....	
24,500	98,000	.0450	.0050	.....	.....	
25,000	100,000	.0500	.0050	.....	.....	
25,500	102,000	.0583	.0083	.....	.....	
26,000	104,000	.0683	.0100	.....	.....	
26,500	106,000	.0900	.0217	.....	.....	
26,680	106,720	.1167	.0267	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	106,720
Elastic limit per square inch of original section	do...	55,000
Elongation per inch after rupture	inch..	0.1500
Elongation per inch under strain at elastic limit	do...	.001867
Reduction in diameter at point of rupture	do...	.104
Reduction in area after rupture, per centum of original section		33.5
Position of rupture		1".05 from neck
Character of broken surface		granular; silky center
Elongation of inch sections		".25*, ".19, ".12, ".12, ".12, ".10

No. 2687.

Marks, $\frac{10\,R_1\,C_3}{M\,T_2\,O}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000300	.000167	0.	.....	
3,750	15,000	.000467	.000167	0.	.....	
5,000	20,000	.000650	.000183	0.	.....	
6,250	25,000	.000800	.000150	0.	.....	
7,500	30,000	.000967	.000167	0.	.....	
8,750	35,000	.001133	.000166	0.	.....	
10,000	40,000	.001300	.000167	0.	.....	
11,250	45,000	.001500	.000200	.....	.....	
12,500	50,000	.001667	.000167	.....	.....	
12,750	51,000	.001700	.000033	.....	.....	
13,000	52,000	.001733	.000033	.....	.....	
13,250	53,000	.001800	.000067	.....	.....	Elastic limit.
13,500	54,000	.002000	.000200	.....	.....	
13,750	55,000	.002333	.000333	.....	.....	
14,000	56,000	.003083	.000750	.....	.....	
14,250	57,000	.003717	.000634	.....	.....	
14,500	58,000	.004417	.000700	.....	.....	
14,750	59,000	.005000	.000583	.....	.....	
15,000	60,000	.005700	.000700	.....	.....	
15,500	62,000	.007167	.001467	.....	.....	
16,000	64,000	.008500	.001333	.....	.....	
16,500	66,000	.009933	.001433	.....	.....	
17,000	68,000	.011333	.001400	.....	.....	
17,500	70,000	.012833	.001500	.....	.....	
18,000	72,000	.014417	.001584	.....	.....	
18,500	74,000	.016083	.001666	.....	.....	
19,000	76,000	.017667	.001584	.....	.....	
19,500	78,000	.019333	.001666	.....	.....	
20,000	80,000	.021333	.002000	.....	.....	
20,500	82,000	.023167	.001834	.....	.....	
21,000	84,000	.025333	.002166	.....	.....	
21,500	86,000	.027633	.002300	.....	.....	
22,000	88,000	.0300	.002367	.....	.....	
22,500	90,000	.0333	.0033	.....	.....	
23,000	92,000	.0367	.0034	.....	.....	
23,500	94,000	.0400	.0033	.....	.....	
24,000	96,000	.0450	.0050	.....	.....	
24,500	98,000	.0500	.0050	.....	.....	
25,000	100,000	.0567	.0067	.....	.....	
25,500	102,000	.0650	.0083	.....	.....	
26,000	104,000	.0800	.0150	.....	.....	
26,310	105,240	.1083	.0283	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	105,240
Elastic limit per square inch of original section	do ..	53,000
Elongation per inch after rupture	inch..	0.1350
Elongation per inch under strain at elastic limit	do...	.001800
Reduction in diameter at point of rupture	do...	.104
Reduction in area after rupture, per centum of original section		33.5
Position of rupture		1″.65 from neck
Character of broken surface		granular; silky center
Elongation of inch sections		″.12, ″.29*, ″.15, ″.10, ″.08, ″.07

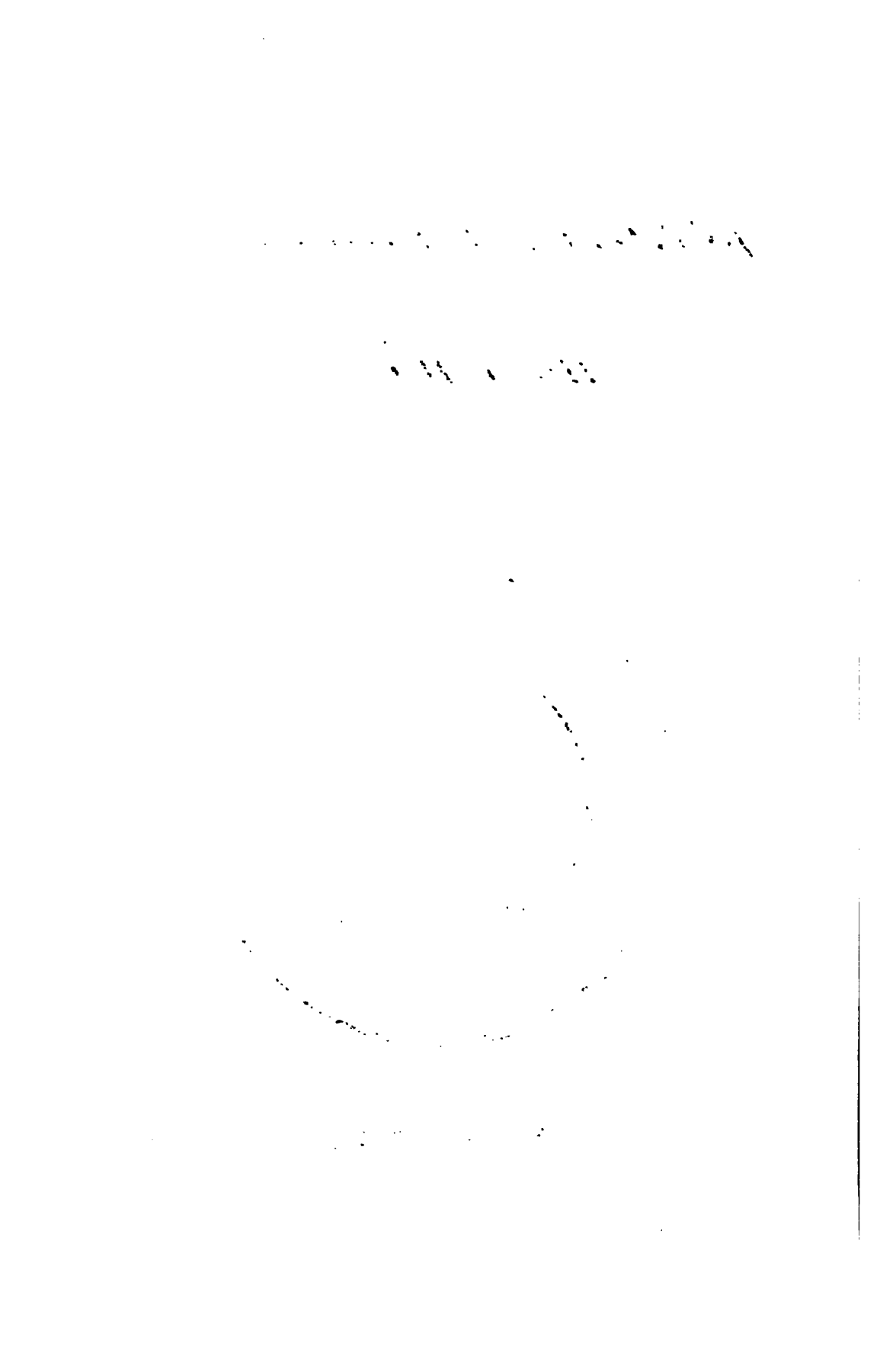
No. 2688.

Marks, $\frac{10\ R_1\ C_3}{M\ T_2\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000283	.000150	0.	.....	
3,750	15,000	.000450	.000167	0.	.....	
5,000	20,000	.000633	.000183	0.	.....	
6,250	25,000	.000817	.000184	0.	.....	
7,500	30,000	.001000	.000183	0.	.....	
8,750	35,000	.001167	.000167	0.	.....	
10,000	40,000	.001333	.000166	0.	.....	
11,250	45,000	.001517	.000184	.....	.....	
12,500	50,000	.001683	.000166	.....	.....	
12,750	51,000	.001717	.000034	.....	.....	
13,000	52,000	.001767	.000050	.....	.....	
13,250	53,000	.001817	.000050	.....	.....	Elastic limit.
13,500	54,000	.001933	.000116	.....	.....	
13,750	55,000	.002000	.000067	.....	.....	
14,000	56,000	.002500	.000500	.....	.....	
14,250	57,000	.002917	.000417	.....	.....	
14,500	58,000	.003683	.000766	.....	.....	
14,750	59,000	.004300	.000617	.....	.....	
15,000	60,000	.005117	.000817	.....	.....	
15,500	62,000	.006583	.001466	.....	.....	
16,000	64,000	.007833	.001250	.....	.....	
16,500	66,000	.009250	.001417	.....	.....	
17,000	68,000	.010667	.001417	.....	.....	
17,500	70,000	.012083	.001416	.....	.....	
18,000	72,000	.013533	.001450	.....	.....	
18,500	74,000	.015000	.001467	.....	.....	
19,000	76,000	.016617	.001617	.....	.....	
19,500	78,000	.018450	.001833	.....	.....	
20,000	80,000	.020333	.001883	.....	.....	
20,500	82,000	.022167	.001834	.....	.....	
21,000	84,000	.024167	.002000	.....	.....	
21,500	86,000	.026167	.002000	.....	.....	
22,000	88,000	.0283	.002133	.....	.....	
22,500	90,000	.0317	.0034	.....	.....	
23,000	92,000	.0333	.0016	.....	.....	
23,500	94,000	.0367	.0034	.....	.....	
24,000	96,000	.0400	.0033	.....	.....	
24,500	98,000	.0467	.0067	.....	.....	
25,000	100,000	.0517	.0050	.....	.....	
25,500	102,000	.0600	.0083	.....	.....	
26,000	104,000	.0700	.0100	.....	.....	
26,500	106,000	.0900	.0200	.....	.....	
26,620	106,480	.1083	.0183	.....	.....	Tensile strength.

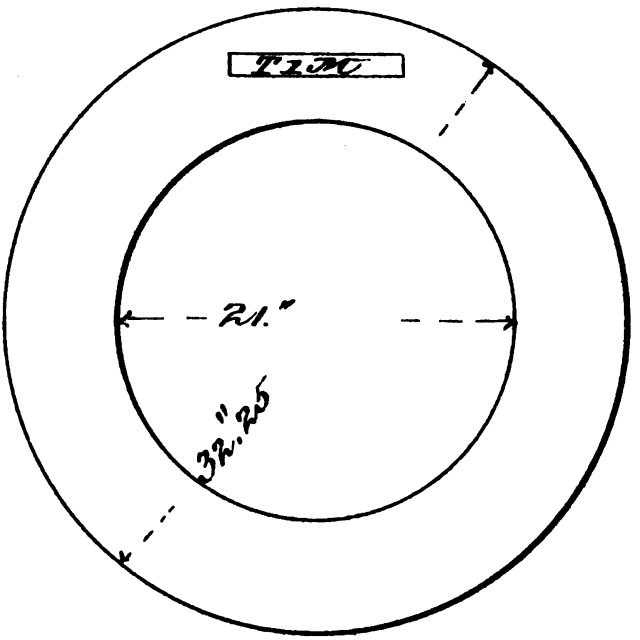
General summary.

Tensile strength per square inch of original section	pounds..	106,480
Elastic limit per square inch of original section	do...	53,000
Elongation per inch after rupture	inch..	0.1300
Elongation per inch under strain at elastic limit	do...	.001817
Reduction in diameter at point of rupture	do...	.094
Reduction in area after rupture, per centum of original section		30.6
Position of rupture		½ inch from neck
Character of broken surface		granular; silky center
Elongation of inch sections		″.08, ″.09, ″.10, ″.11, ″.12, ″.28



10" Steel B.L. Rifle No. 1

Hoop D 1



H Ex 31 492

No. 2774.

Marks, $^{10}_{T_1}\,R_1\,D_1\,M$

Diameter, ".564.

Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000283	.000166	0.	.....	
3,750	15,000	.000433	.000150	0.	.....	
5,000	20,000	.000617	.000184	0.	.....	
6,250	25,000	.000783	.000166	0.	.....	
7,500	30,000	.000933	.000150	0.	.....	
8,750	35,000	.001100	.000167	0.	.....	
10,000	40,000	.001267	.000167	— .000017	— .000017	
11,250	45,000	.001433	.000166	.....	.....	
12,500	50,000	.001617	.000184	.....	.....	
12,750	51,000	.001650	.000033	.....	.....	
13,000	52,000	.001667	.000017	.....	.....	
13,250	53,000	.001717	.000050	.....	.....	
13,500	54,000	.001750	.000033	.....	.....	
13,750	55,000	.001783	.000033	.....	.....	
14,000	56,000	.001817	.000034	.....	.....	
14,250	57,000	.001867	.000050	.....	.....	Elastic limit.
14,500	58,000	.007333	.005466	.....	.....	
14,750	59,000	.007917	.000584	.....	.....	
15,000	60,000	.008417	.000500	.....	.....	
15,500	62,000	.010000	.001583	.....	.....	
16,000	64,000	.011750	.001750	.....	.....	
16,500	66,000	.013667	.001917	.....	.....	
17,000	68,000	.015200	.001533	.....	.....	
17,500	70,000	.017000	.001800	.....	.....	
18,000	72,000	.018967	.001967	.....	.....	
18,500	74,000	.021000	.002033	.....	.....	
19,000	76,000	.022917	.001917	.....	.....	
19,500	78,000	.025500	.002583	.....	.....	
20,000	80,000	.0283	.0028	.....	.....	
20,500	82,000	.0317	.0034	.....	.....	
21,000	84,000	.0350	.0033	.....	.....	
21,500	86,000	.0367	.0017	.....	.....	
22,000	88,000	.0400	.0033	.....	.....	
22,500	90,000	.0467	.0067	.....	.....	
23,000	92,000	.0517	.0050	.....	.....	
23,500	94,000	.0550	.0033	.....	.....	
24,000	96,000	.0650	.0100	.....	.....	
24,500	98,000	.0783	.0133	.....	.....	
25,000	100,000	.1033	.0250	.....	.....	
25,060	100,240	.1333	.0300	.....	.....	Tensile strength.

General summary.

Specific gravity		7.8438
Hardness		21.40
Tensile strength per square inch of original section	pounds..	100,240
Elastic limit per square inch of original section	do...	57,000
Elongation per inch after rupture	inch..	0.1533
Elongation per inch under strain at elastic limit	do...	.001867
Reduction in diameter at point of rupture	do...	.124
Reduction in area after rupture, per centum of original section		39.2
Position of rupture		2¼" from neck
Character of broken surface		silky
Elongation of inch sections		".10, ".33*, ".17, ".12, ".11, ".09

TABULATION OF TENSION SPECIMENS FROM WHITWORTH STEEL TUBE FOR 10-INCH STEEL B. L. RIFLE NO. 1.

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation.	Contraction of area.	Appearance of fracture.
			Pounds.	*Pounds.*	*Pr. ct.*	*Pr. ct.*	
2740	Breech.	Inside	33,000	79,600	20.0	33.5	Granular, 60 per cent.; silky, 40 per cent.
2741	....do	Outside	37,000	85,760	21.7	44.6	Silky.
2739	....do	Middle.	35,000	83,880	22.0	44.6	Do.
2738	....do	....do	35,000	82,920	21.3	39.2	Silky; slightly granular.
2742	..do.	Radial.....	31,000	80,600	15.5	27.6	Granular; dull silky spot.
2657	Muzzle.	Inside	31,000	85,800	21.0	36.4	Granular; silky spot.
2658	....do	Outside.....	32,000	72,240	26.0	41.9	Silky.
2659	.. do	Middle.	33,000	78,200	23.7	27.6	Granular; dull silky spot.
2660	.. do	....do.	30,000	77,720	22.7	30.6	Granular, 50 per cent.; silky, 50 per cent.
2661	....do	Radial.....	23,000	79,520	23.0	30.6	Granular, with dull flaky metal.

TABULATION OF COMPRESSION SPECIMENS FROM WHITWORTH STEEL TUBE FOR 10-INCH STEEL B. L. RIFLE NO. 1.

No of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Ultimate strength per square inch.	Manner of failure.
			Pounds.	*Pounds.*	
699	Breech.	Inside	35,000	73,720	Triple flexure.
700	....do	Outside.....	40,000	81,000	Do.
701	....do	Middle	33,000	73,500	Do.
697	....do	Radial.....	34,000	82,760	Do.
698	....do	....do	34,000	80,840	Do.
692	Muzzle.	Inside	30,000	70,300	Do.
693	....do	Outside.....	28,000	61,960	Do.
694	....do	Middle	27,000	69,200	Do.
695	... do.	Radial	28,000	78,760	Do.
696	....do	....do	31,000	79,340	Do.

TABULATION OF TENSION SPECIMENS FROM WHITWORTH STEEL JACKET FOR 10-INCH STEEL B. L. RIFLE NO. 1.

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation.	Contraction of area.	Appearance of fracture.
			Pounds.	*Pounds.*	*Pr ct.*	*Pr ct.*	
2652	Breech.....	Inside	39,000	94,560	12.3	18.3	Granular.
2653	....do	Outside	45,000	91,240	18.0	47.2	Silky.
2654	....do	Middle	34,000	85,440	16.7	33.5	Granular; dull spot.
2655	....do.....	....do	30,000	84,040	19.0	33.5	Do.
2656	....do	Radial.....	36,000	87,120	13.3	18.3	Do.
2647	Muzzle	Inside	37,000	82,000	20.0	49.7	Silky.
2648	....do	Outside.....	44,000	90,000	19.7	47.2	Silky; trace of granulation.
2649	....do	Middle	39,000	80,400	26.0	44.6	Do.
2650	....do	....do	38,000	80,800	27.0	49.7	Silky.
2651	....do	Radial.....	34,000	80,400	22.7	44.6	Do.

TABULATION OF COMPRESSION SPECIMENS FROM WHITWORTH STEEL JACKET FOR 10-INCH STEEL B. L. RIFLE NO. 1.

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Ultimate strength per square inch.	Manner of failure.	Remarks.
			Pounds.	*Pounds.*		
687	Breech.....	Inside	60,000	93,200	Triple flexure...	
688	....do	Outside.....	48,000	81,100	....do	
689	...do	Middle	32,000	76,320	....do	
690	....do	Radial.....	36,000	80,520	....do	Specific gravity (outside), 7.8635.
691	....do	....do	35,000	81,480	.. do	Specific gravity (inside), 7.8610.
682	Muzzle	Initial	45,000	81,600	....do	
683	....do	Outside.....	47,000	86,400	.. do	
684	....do	Middle.....	36,000	73,800	... do	
685	....do	Radial.....	42,000	71,700	....do	
686	....do	....do	42,000	72,200	....do	Specific gravity, 7.8677.

TABULATION OF SPECIMENS FROM HOOPS FOR 10-INCH STEEL B. L. RIFLE NO. 1.

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation.	Contraction of area.	Appearance of fracture.	Specific gravity.	Hardness.	Remarks.
			Pounds.	*Pounds.*	*Per cent*	*Per cent.*				
2746	Trunnion hoop	Inside	39,000	82,960	13.3	18.4	Silky			Whitworth steel.
2747	do	Outside	42,000	85,440	17.3	59.3	do			Do.
2748	do	Middle	35,000	79,520	18.3	57.0	do			Do.
2749	do	do	43,000	83,920	17.5	57.0	do			Do.
2678	Hoop A_4	do	58,000	104,240	14.0	41.9	do			
2681	Hoop A_5	do	55,000	97,840	16.7	49.7	do			
2777	Hoop A_5	Inside	59,000	104,760	15.2	49.7	do	7.8424	20.70	
2602	Hoop B_2	Middle	62,000	106,280	16.0	41.9	do			
2603	Hoop B_2	Outside	66,000	115,160	13.8	33.5	Silky, with fine granulation			
2604	Hoop B_2	Middle	65,000	113,680	14.7	27.6	do			
2743	Hoop B_2	do	61,000	108,640	15.0	41.9	Fine silky			
2744	Hoop B_2	Inside	65,000	113,920	11.5	36.4	Silky; traces of granulation			
2775	Hoop B_2	Middle	53,000	98,320	18.2	47.2	Silky			
2682	Hoop B_4	do	61,000	108,120	16.5	49.7	do	7.8432	24.26	
2679	Hoop B_5	do	54,000	102,000	15.3	44.6	do			
2605	Hoop B_5	do	57,000	106,440	12.7	39.2	do	7.8888	24.26	
2745	Hoop B_6	do	57,000	98,320	14.5	27.6	Granular, 50 per cent.; silky, 50 per cent.			
2615	Hoop B_7	do	63,000	107,200	17.8	41.9	Silky			
2822	Hoop B_7	do	62,000	109,560	15.3	44.6	Fine silky	7.8419	21.64	
2576	Hoop C_1	Inside	68,000	108,720	15.5	30.6	Silky			
2680	Hoop C_1	Middle	64,000	110,040	15.5	47.2	Fine silky	7.8376	24.83	
2778	Hoop C_2	do	64,000	106,800	7.7	11.8	Granular, with silky metal	7.8491	21.89	
2646	Hoop C_3	do	62,000	100.000	16.3	49.7	Silky			
2208	Hoop C_3	do	47,000	91,370	14.8	34.7	Granular; dull spot	7.8546	18.19	
2762	Hoop C_5	Inside	67,000	118,880	10.8	27.6	do			
2763	Hoop C_5	Outside	58,000	113,800	10.3	15.0	do			
2764	Hoop C_5	Middle	59,000	110,800	13.3	33.5	Granular; silky center			
2765	Hoop C_5	Inside	55,000	106,000	6.8	8.4	Granular; flaky spot			
2766	Hoop C_5	Outside	60,000	118,480	11.5	27.6	Granular; silky center			
2767	Hoop C_5	Middle	52,000	106,560	12.5	30.6	do			
2750	Hoop C_6	Inside	61,000	111,640	11.7	33.5	Granular; silky spot			
2751	Hoop C_6	Outside	56,000	110,080	12.3	33.5	Granular; silky center			
2752	Hoop C_6	Middle	57,000	110,520	14.7	33.5	do			
2753	Hoop C_6	Inside	52,000	108,200	11.7	30.6	do			
2754	Hoop C_6	Outside	53,000	110,720	12.8	30.6	do			
2755	Hoop C_6	Middle	51,000	109,240	11.7	27.6	do			
2756	Hoop C_7	Inside	57,000	111,160	9.5	18.3	Granular; dull spot			
2757	Hoop C_7	Outside	55,000	112,480	13.0	27.6	Granular; silky center			
2758	Hoop C_7	Middle	57,000	112,120	9.7	24.6	Granular; dull spot			
2759	Hoop C_7	Inside	55,000	111,200	9.0	21.4	Granular; silky center			
2760	Hoop C_7	Outside	51,000	107,440	14.2	27.6	Granular; silky spot			

2761	Hoop C₇	Middle	53,000	106,440	12.0	30.6	do			
2683	Hoop C₈	Inside	57,000	104,660	11.3	33.5	Granular; silky center			
2684	Hoop C₈	Outside	54,000	106,440	13.0	30.4	do			
2685	Hoop C₈	Middle	54,000	108,240	12.0	21.4	Granular; dull spot			
2686	Hoop C₈	Inside	55,000	106,720	15.0	33.5	Granular; silky center			
2687	Hoop C₈	Outside	53,000	105,240	13.5	33.5	do			
2688	Hoop C₈	Middle	53,000	104,440	13.0	30.6	do			
2774	Hoop D₁	do	57,000	100,240	13.3	30.2	Silky		7.8498	21.40

10-INCH STEEL WIRE WOUND RIFLE.

ADDITIONAL SPECIMENS FROM

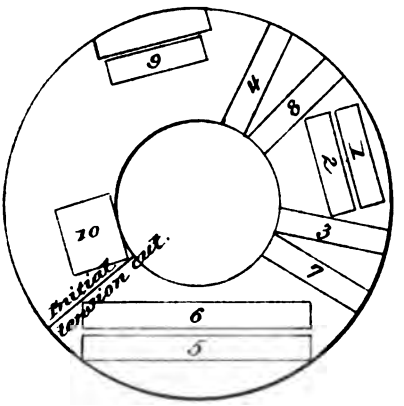
WHITWORTH STEEL TUBE.

TESTS BY TENSION OF UPSET SPECIMENS, AND BULGING TESTS OF DISKS.

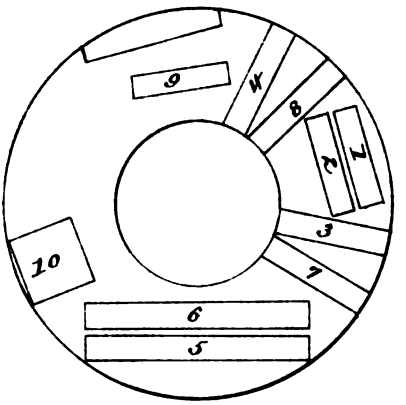
10" Steel wire-wound Rifle.

Tube

Breech



Muzzle



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10-INCH STEEL WIRE WOUND RIFLE.

ADDITIONAL SPECIMENS FROM WHITWORTH STEEL TUBE.

No. 527.

Marks, 9 B.
Length, 4″.10.
Diameter, 1″.039.
Sectional area, ″.848 square inch.
Compression load of 39,300 pounds=46,340 pounds per square inch required to shorten specimen 1 per centum of length.
Middle diameter after compressing, 1″.0445; enlargement, ″.0055.

No. 528.

Marks, 9 M.
Length, 4″.10.
Diameter, ″.974.
Sectional area, ″.745 square inch.
Compression load of 29,600 pounds=39,730 pounds per square inch required to shorten specimen 1 per centum of length.
Middle diameter after compressing, ″.9797; enlargement, ″.0057.

No. 990.

Marks, 9 B
Diameter, ″.564.
Sectional area, .25 square inch.
This specimen and one following were previously shortened by compression 1 per centum of length.
Tested by tension seven days after the compression test.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100			
2,500	10,000	.000350	.000250			
3,750	15,000	.000500	.000150			
5,000	20,000	.000650	.000150			
5,500	22,000	.000650	0.			
5,750	23,000	.000700	.000050			
6,000	24,000	.000750	.000050			Elastic limit.
6,250	25,000	.001150	.000400	.000400	.000400	
6,500	26,000	.001450	.000300			
6,750	27,000	.001700	.000250			
7,000	28,000	.001950	.000250			
7,250	29,000	.002200	.000250			
7,500	30,000	.002600	.000400	.001700	.001300	
7,750	31,000	.003150	.000550			
8,000	32,000	.003700	.000550			
8,250	33,000	.003950	.000250			
8,500	34,000	.004650	.000700			
8,750	35,000	.005100	.000450	.003900	.002200	
9,000	36,000	.005850	.000750			
9,250	37,000	.006250	.000400			
9,500	38,000	.006600	.000350			
9,750	39,000	.007200	.000600			
10,000	40,000	.008150	.000950	.006650	.002750	
10,250	41,000	.008950	.000800			
10,500	42,000	.009500	.000550			
10,750	43,000	.010050	.000550			
11,000	44,000	.010800	.000750			
11,250	45,000	.011800	.001000			
11,500	46,000	.012550	.000750			
11,750	47,000	.013750	.001200			
12,000	48,000	.014750	.001000			
12,250	49,000	.015750	.001000			
12,500	50,000	.017500	.001750			
13,000	52,000	.019650	.002150			
13,500	54,000	.022000	.002350			
14,000	56,000	.025000	.003000			
14,500	58,000	.028250	.003250			
15,000	60,000	.031250	.003000			
15,500	62,000	.034900	.003650			
16,000	64,000	.038650	.003750			
16,500	66,000	.043250	.004600			
17,000	68,000	.048750	.005500			
17,500	70,000	.059000	.010250			
18,000	72,000	.0650	.0060			
18,500	74,000	.0700	.0050			
19,000	76,000	.0850	.0150			
19,500	78,000	.1050	.0200			
19,920	79,680	.1650	.0600			Tensile strength.
18,200						Load at time of rupture.

General summary.

Tensile strength per square inch of original section	pounds..	79,680
Elastic limit per square inch of original section	do...	24,000
Elongation per inch after rupture	inch..	0.2850
Elongation per inch under strain at elastic limit	do...	.000750
Reduction in diameter at point of rupture	do...	.134
Reduction in area after rupture, per centum of original section		41.9
Position of rupture		⅝ inch from middle of stem
Character of broken surface		silky; interspersed with fine granular metal
Elongation of inch sections		″.38, ″.19

No. 991.

Marks, 9 M
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.		
2,500	10,000	.000800	.000200	0.		
3,750	15,000	.000800	.000200	0.		
5,000	20,000	.000950	.000450	.000850	.000350	Elastic limit probably 19,000 pounds per square inch.
5,250	21,000	.001050	.000100			
5,500	22,000	.001250	.000200			
5,750	23,000	.001500	.000250			
6,000	24,000	.001750	.000250			
6,250	25,000	.001950	.000200			
6,500	26,000	.002400	.000450			
6,750	27,000	.002750	.000350			
7,000	28,000	.003250	.000500			
7,250	29,000	.003650	.000400			
7,500	30,000	.004350	.000700	.003850	.003000	
7,750	31,000	.004900	.000550			
8,000	32,000	.005400	.000500			
8,250	33,000	.006100	.000700			
8,500	34,000	.006850	.000750			
8,750	35,000	.007650	.000800	.006400	.003050	
9,000	36,000	.008400	.000750			
9,250	37,000	.009150	.000750			
9,500	38,000	.010050	.000900			
9,750	39,000	.010950	.000900			
10,000	40,000	.011950	.001000			
10,500	42,000	.015000	.003050			
11,000	44,000	.017700	.002700			
11,500	46,000	.020750	.003050			
12,000	48,000	.024500	.003750			
12,500	50,000	.028500	.004000			
13,000	52,000	.032900	.004400			
13,500	54,000	.038500	.005600			
14,000	56,000	.044750	.006250			
14,500	58,000	.051500	.006750			
15,000	60,000	.059000	.007500			
15,500	62,000	.0850	.0060			
16,000	64,000	.0850	.0200			
16,500	66,000	.1000	.0150			
17,000	68,000	.1450	.0450			
17,130	68,520	.2000	.0550			Tensile strength.
14,700						Load at time of rupture.

General summary.

Tensile strength per square inch of original section	pounds..	68,520
Elastic limit per square inch of original section (probably)	do...	19,000
Elongation per inch after rupture	inch..	0.3400
Reduction in diameter at point of rupture	do...	.164
Reduction in area after rupture, per centum of original section		49.7
Position of rupture		⅜ inch from middle of stem; oblique
Character of broken surface		silky
Elongation of inch sections		".48*, ."25

BULGING TESTS.

[Specimens 3″ square by ″.20 thick.]

Tested by being placed upon a ring of steel 2½ inches interior diameter and distorted by a plunger 1½ inches diameter with hemispherical end.

Pressure applied and continued till the specimen cracked.

No. 542.

Marks, B 10.

Bulged ″.46, measured after fracture.

Cracked across face, which remained open ″.03 at the middle of its length.

No. 543.

Marks, M 10.

Bulged ″.79, measured after fracture.

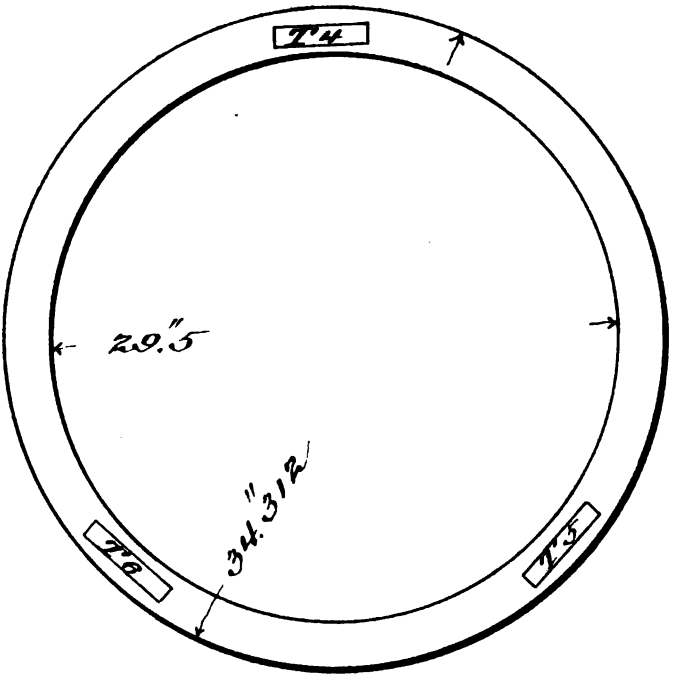
Cracked across face, which remained open ″.25 at the middle of its length.

Appearance of fracture, granular.

A plunger with 1 inch hemispherical end was first employed in bulging this disk ″.4, after which the 1½-inch plunger was used.

10" Steel Wire-wound Rifle

Sleeve



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NEW SLEEVE.

No. 2561.

Marks, $\frac{10\,Se}{T_4}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.		
2,500	10,000	.000233	.000133	0.		
3,750	15,000	.000433	.000200	0.		
5,000	20,000	.000600	.000167	0.		
6,250	25,000	.000767	.000167	0.		
7,500	30,000	.000933	.000166	0.		
8,750	35,000	.001167	.000234			
10,000	40,000	.001400	.000233			
11,250	45,000	.001533	.000133			
12,500	50,000	.001700	.000167			Elastic limit.
12,750	51,000	.001800	.000100			
13,000	52,000	.001933	.000133			
13,250	53,000	.002033	.000100			
13,500	54,000	.004667	.002634			
13,750	55,000	.005833	.001166			
14,000	56,000	.006667	.000834			
14,250	57,000	.007600	.000933			
14,500	58,000	.008700	.001100			
14,750	59,000	.010000	.001300			
15,000	60,000	.010833	.000833			
15,500	62,000	.012667	.001834			
16,000	64,000	.014733	.002066			
16,500	66,000	.016767	.002034			
17,000	68,000	.019000	.002233			
17,500	70,000	.021000	.002000			
18,000	72,000	.023433	.002433			
18,580	74,000	.026167	.002734			
19,000	76,000	.028733	.002566			
19,500	78,000	.032000	.003267			
20,000	80,000	.0367	.0047			
20,500	82,000	.0400	.0033			
21,000	84,000	.0433	.0033			
21,500	86,000	.0467	.0034			
22,000	88,000	.0567	.0100			
22,500	90,000	.0667	.0100			
23,000	92,000	.0800	.0133			
23,470	93,880	.1300	.0500			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	93,880
Elastic limit per square inch of original section	do...	50,000
Elongation per inch after rupture	inch..	0.2100
Elongation per inch under strain at elastic limit	do...	.001700
Reduction in diameter at point of rupture	do...	.154
Reduction in area after rupture, per centum of original section		47.2
Position of rupture		1″.60 from neck
Character of broken surface		silky; opened cracks in surface of stem
Elongation of inch sections		″.15, ′.37*, ″.11

No. 2562.

Marks, $^{10}_{T_5}S_2$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000267	.000167	0.	.....	
3,750	15,000	.000400	.000133	0.	.....	
5,000	20,000	.000600	.000200	0.	.....	
6,250	25,000	.000800	.000200	0.	.....	
7,500	30,000	.000967	.000167	0.	.....	
8,750	35,000	.001167	.000200	.....	.....	
10,000	40,000	.001333	.000166	.....	.....	
11,250	45,000	.001467	.000134	.....	.....	
11,500	46,000	.001500	.000033	.....	.....	
11,750	47,000	.001533	.000033	.....	.....	
12,000	48,000	.001600	.000067	.....	.....	
12,250	49,000	.001633	.000033	.....	.....	
12,500	50,000	.001667	.000034	.....	.....	Elastic limit.
12,750	51,000	.001767	.000100	.....	.....	
13,000	52,000	.002500	.000733	.....	.....	
13,250	53,000	.004300	.001800	.....	.....	
13,500	54,000	.006300	.002000	.....	.....	
13,750	55,000	.007067	.000767	.....	.....	
14,000	56,000	.007933	.000866	.....	.....	
14,250	57,000	.008833	.000900	.....	.....	
14,500	58,000	.009867	.001034	.....	.....	
14,750	59,000	.010900	.001033	.....	.....	
15,000	60,000	.012167	.001267	.....	.....	
15,500	62,000	.014133	.001966	.....	.....	
16,000	64,000	.016033	.001900	.....	.....	
16,500	66,000	.018167	.002134	.....	.....	
17,000	68,000	.020500	.002333	.....	.....	
17,500	70,000	.023000	.002500	.....	.....	
18,000	72,000	.025433	.002433	.....	.....	
18,500	74,000	.028600	.003167	.....	.....	
19,000	76,000	.031333	.002733	.....	.....	
19,500	78,000	.034667	.003334	.....	.....	
20,000	80,000	.0400	.005333	.....	.....	
20,500	82,000	.0433	.0033	.....	.....	
21,000	84,000	.0500	.0067	.....	.....	
21,500	86,000	.0567	.0067	.....	.....	
22,000	88,000	.0633	.0066	.....	.....	
22,500	90,000	.0767	.0134	.....	.....	
23,000	92,000	.1000	.0233	.....	.....	
23,080	92,320	.1300	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	92,320
Elastic limit per square inch of original section	do...	50,000
Elongation per inch after rupture	inch..	0.2067
Elongation per inch under strain at elastic limit	do...	.001667
Reduction in diameter at point of rupture	do...	.164
Reduction in area after rupture, per centum of original section		49.7
Position of rupture		″.90 from neck
Character of broken surface	silky; opened small cracks in surface of stem	
Elongation of inch sections		″.09, ″.14, ″.39

No. 2563.

Marks, $\frac{\text{TO S}_2}{\text{T}_6}$
Diameter, ″.564.
Sectional area, .25 square inch.

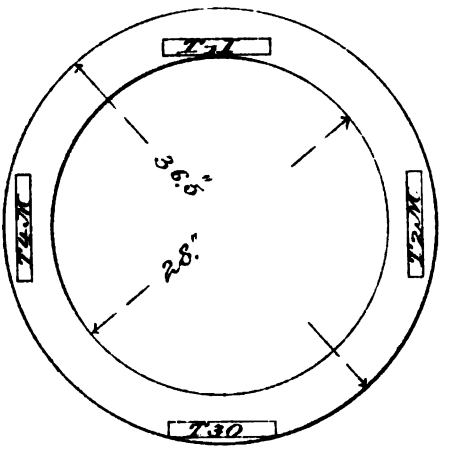
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000267	.000167	0.	.....	
3,750	15,000	.000433	.000166	0.	.....	
5,000	20,000	.000600	.000167	0.	.....	
6,250	25,000	.000800	.000200	0.	.....	
7,500	30,000	.000967	.000167	0.	.....	
8,750	35,000	.001100	.000133	.....	.....	
10,000	40,000	.001267	.000167	.....	.....	
11,250	45,000	.001433	.000166	.....	.....	
11,500	46,000	.001500	.000067	.....	.....	
11,750	47,000	.001567	.000067	.....	.....	
12,000	48,000	.001633	.000066	.....	.....	
12,250	49,000	.001667	.000034	.....	.....	
12,500	50,000	.001700	.000033	.....	.....	
12,750	51,000	.001733	.000033	.....	.....	Elastic limit.
13,000	52,000	.001867	.000134	.....	.....	
13,250	53,000	.002867	.001000	.....	.....	
13,500	54,000	.005333	.002466	.....	.....	
13,750	55,000	.006600	.001267	.....	.....	
14,000	56,000	.007533	.000933	.....	.....	
14,250	57,000	.008367	.000834	.....	.....	
14,500	58,000	.009500	.001133	.....	.....	
14,750	59,000	.010500	.001000	.....	.....	
15,000	60,000	.011500	.001000	.....	.....	
15,500	62,000	.013167	.001667	.....	.....	
16,000	64,000	.015333	.002166	.....	.....	
16,500	66,000	.017433	.002100	.....	.....	
17,000	68,000	.019833	.002400	.....	.....	
17,500	70,000	.022167	.002334	.....	.....	
18,000	72,000	.024667	.002500	.....	.....	
18,500	74,000	.027500	.002833	.....	.....	
19,000	76,000	.030667	.003167	.....	.....	
19,500	78,000	.033567	.002900	.....	.....	
20,000	80,000	.037167	.003600	.....	.....	
20,500	82,000	.0400	.002833	.....	.....	
21,000	84,000	.0467	.0067	.....	.....	
21,500	86,000	.0567	.0100	.....	.....	
22,000	88,000	.0633	.0066	.....	.....	
22,500	90,000	.0700	.0067	.....	.....	
23,000	92,000	.0933	.0233	.....	.....	
23,100	92,400	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	92,400
Elastic limit per square inch of original section	do...	51,000
Elongation per inch after rupture	inch..	0.0967
Elongation per inch under strain at elastic limit	do...	.001733
Reduction in diameter at point of rupture	do...	.044
Reduction in area after rupture, per centum of original section		15.0
Position of rupture		″.40 from neck
Character of broken surface, granular; radiating from a flaky spot at the circumference; opened small cracks in the surface of stem.		
Elongation of inch sections		″.07, ″.08, ″.14*

10" Cast Iron Wire-wound Rifle No. 1

Steel hoop



H Ex 31 49 2

SPECIMENS FROM EDGE OF HOOP.

No. 2642.

Marks, $\frac{10\ W\ R_1\ H}{T_1\ I}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000317	.000184	0.	.....	
3,750	15,000	.000483	.000166	0.	.....	
5,000	20,000	.000650	.000167	0.	.....	
6,250	25,000	.000817	.000167	0.	.....	
7,500	30,000	.000983	.000166	0.	.....	
8,750	35,000	.001150	.000167	.....	.....	
10,000	40,000	.001317	.000167	.....	.....	
11,250	45,000	.001450	.000133	.....	.....	
12,500	50,000	.001633	.000183	.....	.....	
12,750	51,000	.001667	.000034	.....	.....	
13,000	52,000	.001683	.000016	.....	.....	
13,250	53,000	.001717	.000034	.....	.....	
13,500	54,000	.001783	.000066	.....	.....	
13,750	55,000	.001850	.000067	.....	.....	
14,000	56,000	.001883	.000033	.....	.....	Elastic limit.
14,250	57,000	.002017	.000134	.....	.....	
14,500	58,000	.002300	.000283	.....	.....	
14,750	59,000	.002483	.000183	.....	.....	
15,000	60,000	.002850	.000367	.....	.....	
15,500	62,000	.004000	.001150	.....	.....	
16,000	64,000	.005217	.001217	.....	.....	
16,500	66,000	.006867	.001650	.....	.....	
17,000	68,000	.008250	.001383	.....	.....	
17,500	70,000	.010000	.001750	.....	.....	
18,000	72,000	.011500	.001500	.....	.....	
18,500	74,000	.013083	.001583	.....	.....	
19,000	76,000	.014917	.001834	.....	.....	
19,500	78,000	.016667	.001750	.....	.....	
20,000	80,000	.018667	.002000	.....	.....	
20,500	82,000	.020500	.001833	.....	.....	
21,000	84,000	.022500	.002000	.....	.....	
21,500	86,000	.024833	.002333	.....	.....	
22,000	88,000	.027000	.002167	.....	.....	
22,500	90,000	.0300	.0030	.....	.....	
23,000	92,000	.0333	.0033	.....	.....	
23,500	94,000	.0367	.0034	.....	.....	
24,000	96,000	.0400	.0033	.....	.....	
24,500	98,000	.0450	.0050	.....	.....	
25,000	100,000	.0500	.0050	.....	.....	
25,500	102,000	.0550	.0050	.....	.....	
26,000	104,000	.0667	.0117	.....	.....	
26,500	106,000	.0833	.0166	.....	.....	
26,680	106,720	.1033	.0200	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	106,720
Elastic limit per square inch of original section	do...	56,000
Elongation per inch after rupture	inch..	0.1367
Elongation per inch under strain at elastic limit	do...	.001883
Reduction in diameter at point of rupture	do ..	.114
Reduction in area after rupture, per centum of original section		36.4
Position of rupture		″.40 from middle of stem
Character of broken surface		granular; dull center
Elongation of inch sections		″.07, ″.09, ″.14, ″.29*, ″.13, ″.10

No. 2643.

Marks, $^{10\ W\ R_1\ H}_{T_2\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000333	.000200	0.	.....	
3,750	15,000	.000467	.000134	0.	.....	
5,000	20,000	.000633	.000166	0.	.....	
6,250	25,000	.000800	.000167	0.	.....	
7,500	30,000	.000967	.000167	0.	.....	
8,750	35,000	.001133	.000166	0.	.....	
10,000	40,000	.001300	.000167	0.	.....	
11,250	45,000	.001467	.000167	.....	.....	
12,500	50,000	.001633	.000166	.....	.....	
12,750	51,000	.001667	.000034	.....	.....	
13,000	52,000	.001700	.000033	.....	.....	
13,250	53,000	.001733	.000033	.....	.....	
13,500	54,000	.001783	.000050	.....	.....	
13,750	55,000	.001817	.000034	.....	.....	
14,000	56,000	.001867	.000050	.....	.....	
14,250	57,000	.001917	.000050	.....	.....	Elastic limit.
14,500	58,000	.002050	.000133	.....	.....	
14,750	59,000	.002167	.000117	.....	.....	
15,000	60,000	.002433	.000266	.....	.....	
15,500	62,000	.003083	.000650	.....	.....	
16,000	64,000	.004167	.001084	.....	.....	
16,500	66,000	.005450	.001283	.....	.....	
17,000	68,000	.006867	.001417	.....	.....	
17,500	70,000	.008333	.001466	.....	.....	
18,000	72,000	.009667	.001334	.....	.....	
18,500	74,000	.011167	.001500	.....	.....	
19,000	76,000	.012667	.001500	.....	.....	
19,500	78,000	.014217	.001550	.....	.....	
20,000	80,000	.015917	.001700	.....	.....	
20,500	82,000	.017500	.001583	.....	.....	
21,000	84,000	.019333	.001833	.....	.....	
21,500	86,000	.021333	.002000	.....	.....	
22,000	88,000	.023183	.001850	.....	.....	
22,500	90,000	.025667	.002484	.....	.....	
23,000	92,000	.0283	.002633	.....	.....	
23,500	94,000	.0317	.0034	.....	.....	
24,000	96,000	.0350	.0033	.....	.....	
24,500	98,000	.0367	.0017	.....	.....	
25,000	100,000	.0383	.0016	.....	.....	
25,500	102,000	.0450	.0067	.....	.....	
26,000	104,000	.0500	.0050	.....	.....	
26,500	106,000	.0550	.0050	.....	.....	
27,000	108,000	.0650	.0100	.....	.....	
27,500	110,000	.0817	.0167	.....	.....	
27,710	110,840	.1017	.0200	.....	.....	Tensile strength

General summary.

Tensile strength per square inch of original section	pounds..	110,840
Elastic limit per square inch of original section	do...	57,000
Elongation per inch after rupture	inch..	0.1250
Elongation per inch under strain at elastic limit	do...	.001917
Reduction in diameter at point of rupture	do...	.094
Reduction in area after rupture, per centum of original section		30.6
Position of rupture		2¼″ from neck
Character of broken surface		granular: dull center
Elongation of inch sections		″.08, ″.20*, ″.17, ″.11, ″.10, ″.07

No. 2644.

Marks, $\frac{10\ W\ R_1\ H}{T_2\ O}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000283	.000150	0.	.....	
3,750	15,000	.000450	.000167	0.	.....	
5,000	20,000	.000617	.000167	0.	.....	
6,250	25,000	.000783	.000166	0.	.....	
7,500	30,000	.000950	.000167	0.	.....	
8,750	35,000	.001117	.000167	0.	.....	
10,000	40,000	.001300	.000183	0.	.....	
11,250	45,000	.001467	.000167	0.	.....	
12,500	50,000	.001633	.000166	.....	.....	
12,750	51,000	.001683	.000050	.....	.....	
13,000	52,000	.001700	.000017	.....	.....	
13,250	53,000	.001717	.000017	.....	.....	
13,500	54,000	.001767	.000050	.....	.....	
13,750	55,000	.001800	.000033	.....	.....	
14,000	56,000	.001817	.000017	.....	.....	
14,250	57,000	.001867	.000050	.....	.....	
14,500	58,000	.001900	.000033	.....	.....	
14,750	59,000	.001950	.000050	.....	.....	Elastic limit.
15,000	60,000	.002017	.000067	.....	.....	
15,500	62,000	.002283	.000266	.....	.....	
16,000	64,000	.002833	.000550	.....	.....	
16,500	66,000	.003667	.000834	.....	.....	
17,000	68,000	.004817	.001150	.....	.....	
17,500	70,000	.006167	.001350	.....	.....	
18,000	72,000	.007417	.001250	.....	.....	
18,500	74,000	.008850	.001433	.....	.....	
19,000	76,000	.010517	.001667	.....	.....	
19,500	78,000	.012067	.001550	.....	.....	
20,000	80,000	.013550	.001483	.....	.....	
20,500	82,000	.015167	.001617	.....	.....	
21,000	84,000	.016667	.001500	.....	.....	
21,500	86,000	.018500	.001833	.....	.....	
22,000	88,000	.020217	.001717	.....	.....	
22,500	90,000	.022333	.002116	.....	.....	
23,000	92,000	.0233	.000967	.....	.....	
23,500	94,000	.0267	.0034	.....	.....	
24,000	96,000	.0300	.0033	.....	.....	
24,500	98,000	.0317	.0017	.....	.....	
25,000	100,000	.0333	.0016	.....	.....	
25,500	102,000	.0383	.0050	.....	.....	
26,000	104,000	.0433	.0050	.....	.....	
26,500	106,000	.0483	.0050	.....	.....	
27,000	108,000	.0533	.0050	.....	.....	
27,500	110,000	.0617	.0084	.....	.....	
28,000	112,000	.0700	.0083	.....	.....	
28,500	114,000	.0950	.0250	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	114,000
Elastic limit per square inch of original section	do...	59,000
Elongation per inch after rupture	inch..	0.1200
Elongation per inch under strain at elastic limit	do...	.001950
Reduction in diameter at point of rupture	do...	.084
Reduction in area after rupture, per centum of original section		27.6
Position of rupture		1″.70 from neck
Character of broken surface		granular; dull center
Elongation of inch sections		″.10, ″.25*, ″.12, ″.10, ″.09, ″.06

No. 2645.

Marks, $\frac{10\ W\ R}{T\ M}$ H
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	.000017	.000017	
2,500	10,000	.000300	.000167	.000017	0.	
3,750	15,000	.000467	.000167	.000017	0.	
5,000	20,000	.000633	.000166	.000017	0.	
6,250	25,000	.000800	.000167	.000017	0.	
7,500	30,000	.000967	.000167	.000017	0.	
8,750	35,000	.001133	.000166	.000017	0.	
10,000	40,000	.001300	.000167	.000017	0.	
11,250	45,000	.001467	.000167	.000033	.000016	
12,500	50,000	.001633	.000166	.000033	0.	
12,750	51,000	.001667	.000034	.....	.....	
13,000	52,000	.001700	.000033	.....	.....	
13,250	53,000	.001733	.000033	.....	.....	
13,500	54,000	.001800	.000067	.....	.....	
13,750	55,000	.001850	.000050	.....	.....	
14,000	56,000	.001900	.000050	.....	.....	Elastic limit.
14,250	57,000	.002050	.000150	.....	.....	
14,500	58,000	.002283	.000233	.....	.....	
14,750	59,000	.002517	.000234	.....	.....	
15,000	60,000	.002833	.000316	.....	.....	
15,500	62,000	.003733	.000900	.....	.....	
16,000	64,000	.004850	.001117	.....	.....	
16,500	66,000	.006133	.001283	.....	.....	
17,000	68,000	.007467	.001334	.....	.....	
17,500	70,000	.008950	.001483	.....	.....	
18,000	72,000	.010467	.001517	.....	.....	
18,500	74,000	.012000	.001533	.....	.....	
19,000	76,000	.013433	.001433	.....	.....	
19,500	78,000	.015183	.001750	.....	.....	
20,000	80,000	.016850	.001667	.....	.....	
20,500	82,000	.018417	.001567	.....	.....	
21,000	84,000	.020500	.002083	.....	.....	
21,500	86,000	.022500	.002000	.....	.....	
22,000	88,000	.024617	.002117	.....	.....	
22,500	90,000	.027033	.002416	.....	.....	
23,000	92,000	.0300	.002967	.....	.....	
23,500	94,000	.0317	.0017	.....	.....	
24,000	96,000	.0350	.0033	.....	.....	
24,500	98,000	.0383	.0033	.....	.....	
25,000	100,000	.0433	.0050	.....	.....	
25,500	102,000	.0483	.0050	.....	.....	
26,000	104,000	.0517	.0034	.....	.....	
26,500	106,000	.0617	.0100	.....	.....	
27,000	108,000	.0733	.0116	.....	.....	
27,500	110,000	.0983	.0250	.....	.....	
27,600	110,400	.1000	.0017	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	110,400
Elastic limit per square inch of original section	do ..	56,000
Elongation per inch after rupture	inch..	0.1333
Elongation per inch under strain at elastic limit	do...	.001900
Reduction in diameter at point of rupture	do...	.094
Reduction in area after rupture, per centum of original section		30.6
Position of rupture		'.25 from middle of stem
Character of broken surface		granular
Elongation of inch sections		".10, ".15, ".25*, ".14, ".09, ".07

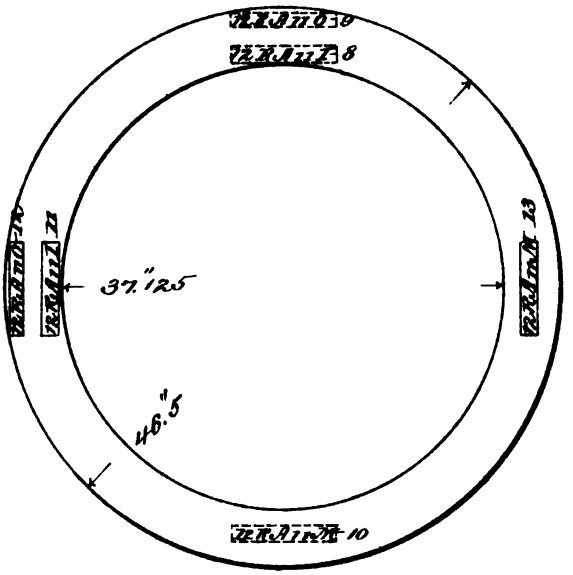
12-INCH CAST-IRON B. L. RIFLE,

HOOPED AND TUBED WITH STEEL.

1097

12" Cast Iron B. L. Rifle, hooped and tubed with Steel.

Hoop A II



H Ex 31 492

12-INCH CAST-IRON B. L. RIFLE, HOOPED AND TUBED WITH STEEL.

ADDITIONAL SPECIMENS FROM NEW HOOP.

No. 1021.

Marks, $\frac{12\,B\,A_{11}}{I_{11}}$

Diameter, ".564.

Sectional area, .25 square inch.

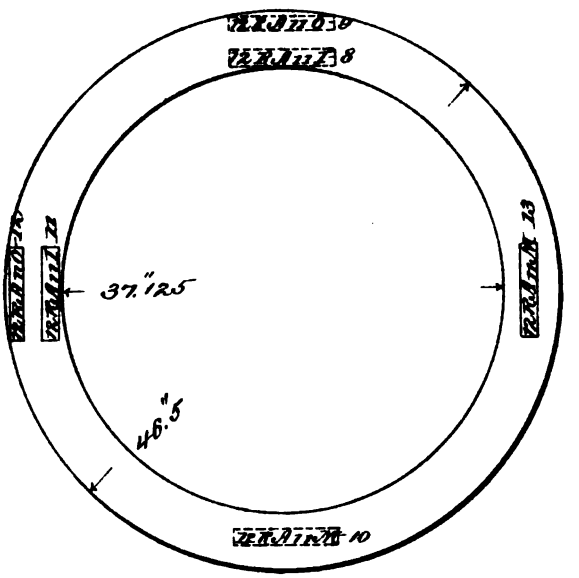
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	.....	
2,500	10,000	.000333	.000166	0.	.....	
3,750	15,000	.000467	.000134	0.	.....	
5,000	20,000	.000650	.000183	0.	.....	
6,250	25,000	.000817	.000167	0.	.....	
7,500	30,000	.000983	.000166	.000017	.000017	
8,750	35,000	.001150	.000167	.000017	0.	
10,000	40,000	.001300	.000150	.000033	.000016	
10,250	41,000	.001333	.000033	.....	.....	
10,500	42,000	.001367	.000034	.....	.....	
10,750	43,000	.001383	.000016	.....	.....	
11,000	44,000	.001417	.000034	.....	.....	
11,250	45,000	.001450	.000033	.000033	0.	
11,500	46,000	.001517	.000067	.....	.....	
11,750	47,000	.001550	.000033	.....	.....	
12,000	48,000	.001600	.000050	.....	.....	
12,250	49,000	.001633	.000033	.....	.....	
12,500	50,000	.001700	.000067	.000067	.000034	
12,750	51,000	.001733	.000033	.....	.....	
13,000	52,000	.001783	.000050	.....	.....	Elastic limit.
13,250	53,000	.001867	.000084	.....	.....	
13,500	54,000	.001950	.000083	.....	.....	
13,750	55,000	.002050	.000100	.000217	.000150	
14,000	56,000	.002233	.000183	.....	.....	
14,250	57,000	.002367	.000134	.....	.....	
14,500	58,000	.002600	.000233	.....	.....	
14,750	59,000	.002783	.000183	.....	.....	
15,000	60,000	.002983	.000200	.000900	.000683	
15,500	62,000	.003367	.000884	.....	.....	
16,000	64,000	.004967	.001100	.....	.....	
16,500	66,000	.006083	.001116	.....	.....	
17,000	68,000	.007583	.001500	.....	.....	
17,500	70,000	.009033	.001450	.....	.....	
18,000	72,000	.010833	.001800	.....	.....	
18,500	74,000	.012667	.001834	.....	.....	
19,000	76,000	.014333	.001666	.....	.....	
19,500	78,000	.016183	.001850	.....	.....	
20,000	80,000	.018100	.001917	.....	.....	
20,500	82,000	.020133	.002033	.....	.....	
21,000	84,000	.022500	.002367	.....	.....	
21,500	86,000	.024100	.001600	.....	.....	
22,000	88,000	.027500	.003400	.....	.....	
22,500	90,000	.029683	.002183	.....	.....	
23,000	92,000	.032667	.002984	.....	.....	
23,500	94,000	.036000	.003333	.....	.....	
24,000	96,000	.0383	.0023	.....	.....	
24,500	98,000	.0433	.0050	.....	.....	
25,000	100,000	.0500	.0067	.....	.....	
25,500	102,000	.0550	.0050	.....	.....	
26,000	104,000	.0650	.0100	.....	.....	
26,480	105,920	.0967	.0317	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	105,920
Elastic limit per square inch of original section	do...	52,000
Elongation per inch after rupture	inch..	0.1233
Elongation per inch under strain at elastic limit	do...	.001783
Reduction in diameter at point of rupture	do...	.104
Reduction in area after rupture, per centum of original section		33.5
Position of rupture		1".4 from middle of stem
Character of broken surface		granular, with dull silky center
Elongation of inch sections		".11, ".28*, ".13, ".08, ".07, ".07

12" Cast Iron B. L. Rifle, hooped and tubed with Steel.

Hoop A II



H Ex 31 492

12-INCH CAST-IRON B. L. RIFLE, HOOPED AND TUBED WITH STEEL.

ADDITIONAL SPECIMENS FROM NEW HOOP.

No. 1021.

Marks, $\frac{12\,R\,A_{11}}{I_{11}}$

Diameter, ".564.

Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	.....	
2,500	10,000	.000333	.000166	0.	.....	
3,750	15,000	.000467	.000134	0.	.....	
5,000	20,000	.000650	.000183	0.	.....	
6,250	25,000	.000817	.000167	0.	.....	
7,500	30,000	.000983	.000166	.000017	.000017	
8,750	35,000	.001150	.000167	.000017	0.	
10,000	40,000	.001300	.000150	.000033	.000016	
10,250	41,000	.001333	.000033	.....	.....	
10,500	42,000	.001367	.000034	.....	.....	
10,750	43,000	.001383	.000016	.....	.....	
11,000	44,000	.001417	.000034	.....	.....	
11,250	45,000	.001450	.000033	.000033	0.	
11,500	46,000	.001517	.000067	.....	.....	
11,750	47,000	.001550	.000033	.....	.....	
12,000	48,000	.001600	.000050	.....	.....	
12,250	49,000	.001633	.000033	.....	.....	
12,500	50,000	.001700	.000067	.000067	.000034	
12,750	51,000	.001733	.000033	.....	.....	
13,000	52,000	.001783	.000050	.....	.....	Elastic limit.
13,250	53,000	.001867	.000084	.....	.....	
13,500	54,000	.001950	.000083	.....	.....	
13,750	55,000	.002050	.000100	.000217	.000150	
14,000	56,000	.002233	.000183	.....	.....	
14,250	57,000	.002367	.000134	.....	.....	
14,500	58,000	.002600	.000233	.....	.....	
14,750	59,000	.002783	.000183	.....	.....	
15,000	60,000	.002983	.000200	.000900	.000683	
15,500	62,000	.003867	.000884	.....	.....	
16,000	64,000	.004967	.001100	.....	.....	
16,500	66,000	.006083	.001116	.....	.....	
17,000	68,000	.007583	.001500	.....	.....	
17,500	70,000	.009033	.001450	.....	.....	
18,000	72,000	.010833	.001800	.....	.....	
18,500	74,000	.012667	.001834	.....	.....	
19,000	76,000	.014333	.001666	.....	.....	
19,500	78,000	.016183	.001850	.....	.....	
20,000	80,000	.018100	.001917	.....	.....	
20,500	82,000	.020123	.002033	.....	.....	
21,000	84,000	.022500	.002367	.....	.....	
21,500	86,000	.024100	.001600	.....	.....	
22,000	88,000	.027500	.003400	.....	.....	
22,500	90,000	.029683	.002183	.....	.....	
23,000	92,000	.032667	.002984	.....	.....	
23,500	94,000	.036000	.003333	.....	.....	
24,000	96,000	.0383	.0023	.....	.....	
24,500	98,000	.0433	.0050	.....	.....	
25,000	100,000	.0500	.0067	.....	.....	
25,500	102,000	.0550	.0050	.....	.....	
26,000	104,000	.0650	.0100	.....	.....	
26,480	105,920	.0967	.0317	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	105,920
Elastic limit per square inch of original section	do...	52,000
Elongation per inch after rupture	inch..	0.1233
Elongation per inch under strain at elastic limit	do...	.001783
Reduction in diameter at point of rupture	do...	.104
Reduction in area after rupture, per centum of original section		33.5
Position of rupture		1".4 from middle of stem
Character of broken surface		granular, with dull silky center
Elongation of inch sections		".11, ".28, ".13, ".08, ".07, ".07

No. 1021½.

Marks, $\frac{12\ R\ A_{11}}{O_{12}}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.		
2,500	10,000	.000317	.000184	0.		
3,750	15,000	.000483	.000166	0.		
5,000	20,000	.000633	.000150	0.		
6,250	25,000	.000783	.000150	0.		
7,500	30,000	.000933	.000150	0.		
8,750	35,000	.001100	.000167	0.		
10,000	40,000	.00125	.000150	0.		
11,250	45,000	.001400	.000150	0.		
11,500	46,000	.001433	.000033			
11,750	47,000	.001483	.000050			
12,000	48,000	.001517	.000034			
12,250	49,000	.001550	.000033			
12,500	50,000	.001617	.000067	.000033	.000033	
12,750	51,000	.001633	.000016			
13,000	52,000	.001700	.000067			
13,250	53,000	.001717	.000017			
13,500	54,000	.001767	.000050			
13,750	55,000	.001800	.000033	.000033	0.	
14,000	56,000	.001883	.000083			
14,250	57,000	.001933	.000050			
14,500	58,000	.002000	.000067			
14,750	59,000	.002033	.000033			Elastic limit.
15,000	60,000	.002283	.000250	.000300	.000267	
15,500	62,000	.002700	.000417			
16,000	64,000	.003333	.000633			
16,500	66,000	.004167	.000831			
17,000	68,000	.005000	.000833			
17,500	70,000	.006200	.001200			
18,000	72,000	.007667	.001467			
18,500	74,000	.009333	.001666			
19,000	76,000	.010833	.001500			
19,500	78,000	.012000	.001167			
20,000	80,000	.013800	.001800			
20,500	82,000	.015333	.001533			
21,000	84,000	.017500	.002167			
21,500	86,000	.019633	.002133			
22,000	88,000	.021333	.001700			
22,500	90,000	.023167	.001834			
23,000	92,000	.025067	.002500			
23,500	94,000	.027967	.002300			
24,000	96,000	.030333	.002366			
24,500	98,000	.033033	.002700			
25,000	100,000	.036333	.003300			
25,500	102,000	.0400	.003667			
26,000	104,000	.0450	.0050			
26,500	106,000	.0500	.0050			
27,000	108,000	.0567	.0067			
27,500	110,000	.0650	.0083			
28,000	112,000	.0883	.0233			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	112,000
Elastic limit per square inch of original section	do...	59,000
Elongation per inch after rupture	inch..	0.1133
Elongation per inch under strain at elastic limit	do...	.002033
Reduction in diameter at point of rupture	do...	.104
Reduction in area after rupture, per centum of original section		33.5
Position of rupture		".60 from middle of stem
Character of broken surface		granular at circumference; silky center
Elongation of inch sections		".07, ".11, ".24*, ".10, ".08, ".08

No. 1022.

Marks, $\frac{12\,B\,A_{11}}{M_{13}}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	.....	
2,500	10,000	.000317	.000167	0.	.....	
3,750	15,000	.000467	.000150	0.	.....	
5,000	20,000	.000633	.000166	0.	.....	
6,250	25,000	.000767	.000134	0.	.....	
7,500	30,000	.000967	.000200	0.	.....	
8,750	35,000	.001117	.000150	0.	.....	
10,000	40,000	.001283	.000166	0.	.....	
10,250	41,000	.001300	.000017	.....	.....	
10,500	42,000	.001317	.000017	.....	.....	
10,750	43,000	.001333	.000016	.....	.....	
11,000	44,000	.001367	.000034	.....	.....	
11,250	45,000	.001400	.000033	0.	.....	
11,500	46,000	.001450	.000050	.....	.....	
11,750	47,000	.001483	.000033	.....	.....	
12,000	48,000	.001517	.000034	.....	.....	
12,250	49,000	.001550	.000033	.....	.....	
12,500	50,000	.001600	.000050	0.	.....	
12,750	51,000	.001633	.000033	.....	.....	
13,000	52,000	.001650	.000017	.....	.....	
13,250	53,000	.001700	.000050	.....	.....	
13,500	54,000	.001733	.000033	.....	.....	
13,750	55,000	.001783	.000050	.000017	.000017	
14,000	56,000	.001833	.000050	.....	.....	Elastic limit.
14,250	57,000	.002083	.000250	.....	.....	
14,500	58,000	.002900	.000817	.....	.....	
14,750	59,000	.003750	.000850	.....	.....	
15,000	60,000	.004283	.000533	.002133	.002116	
15,500	62,000	.005367	.001084	.....	.....	
16,000	64,000	.006717	.001350	.....	.....	
16,500	66,000	.008617	.001900	.....	.....	
17,000	68,000	.010000	.001383	.....	.....	
17,500	70,000	.011600	.001600	.....	.....	
18,000	72,000	.013300	.001700	.....	.....	
18,500	74,000	.015333	.002033	.....	.....	
19,000	76,000	.017083	.001750	.....	.....	
19,500	78,000	.018833	.001750	.....	.....	
20,000	80,000	.021417	.002584	.....	.....	
20,500	82,000	.023667	.002250	.....	.....	
21,000	84,000	.025917	.002250	.....	.....	
21,500	86,000	.028417	.002500	.....	.....	
22,000	88,000	.031250	.002833	.....	.....	
22,500	90,000	.034583	.003333	.....	.....	
23,000	92,000	.0383	.003717	.....	.....	
23,500	94,000	.0433	.0050	.....	.....	
24,000	96,000	.0483	.0050	.....	.....	
24,500	98,000	.0533	.0050	.....	.....	
25,000	100,000	.0617	.0084	.....	.....	
25,500	102,000	.0783	.0166	.....	.....	
25,980	103,920	.1150	.0367	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	103,920
Elastic limit per square inch of original section	do...	56,000
Elongation per inch after rupture	inch..	0.1383
Elongation per inch under strain at elastic limit	do...	.001833
Reduction in diameter at point of rupture	do...	.134
Reduction in area after rupture, per centum of original section		41.9
Position of rupture		″.85 from middle of stem
Character of broken surface		silky, with traces of granulation
Elongation of inch sections		″.10, ″.17, ″.29*, ″.12, ″.08, ″.07

12-INCH CAST-IRON B. L. RIFLE,

HOOPED AND TUBED WITH STEEL.

EXPERIMENTAL SECTION.

SPECIMENS FROM FIRST AND SECOND SLICE FROM CAST-IRON BODY, AND STEEL HOOPS AND TUBE.

1103

TENACITY SPECIMENS.

Marks, $12''\ \frac{H}{C}\ \&\ T$

No. of test.	Nos.	Diameter.	Sectional area.	Tensile strength.		Appearance of fracture.
				Total.	Pounds.	
		Inches.	*Sq. inch.*	*Pounds.*	*Per sq. inch.*	
1117	9	.564	.25	7,440	29,760	Uniform granulation.
1118	10	.564	.25	8,600	34,400	Do.

No. 1120.

Marks, $\frac{12''\ H\ \&\ T}{C}$ No. 1
Diameter, ".564.
Sectional area, .25 square inch.
Length 6".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
500	2,000	.000050	.000050	0.	.....	
750	3,000	.000083	.000033	0.	.....	
1,000	4,000	.000133	.000050	0.	.....	
1,250	5,000	.000183	.000050	0.	.....	
1,500	6,000	.000233	.000050	0.	.....	
1,750	7,000	.000267	.000034	0.	.....	
2,000	8,000	.000350	.000083	0.	.....	
2,250	9,000	.000417	.000067	0.	.....	
2,500	10,000	.000467	.000050	0.	.....	
2,750	11,000	.000517	.000050	0.	.....	
3,000	12,000	.000600	.000083	.000033	.000033	
3,250	13,000	.000633	.000033	.000033	0.	
3,500	14,000	.000717	.000084	.000067	.000034	
3,750	15,000	.000783	.000066	.000083	.000016	
4,000	16,000	.000883	.000100	.000117	.000034	
4,250	17,000	.000967	.000084	.000150	.000033	
4,500	18,000	.001117	.000150	.000200	.000050	
4,750	19,000	.001183	.000066	.000233	.000033	
5,000	20,000	.001283	.000100	.000283	.000050	
5,250	21,000	.001433	.000150	.000367	.000084	
5,500	22,000	.001633	.000200	.000467	.000100	
5,750	23,000	.001767	.000134	.000617	.000150	
6,000	24,000	.002000	.000233	.000083	.000066	
6,250	25,000	.002467	.000467	.001050	.000367	
6,500	26,000	.002817	.000350	.001333	.000283	
6,690	26,760	.....	.....	.....	.....	Tensile strength.

Fractured 1".8 from neck.
Character of broken surface, uniform granulation.

No. 1121.

Marks, $\frac{12''\ H\ \&\ T}{C}$ No. 2
Diameter, ".564.
Sectional area, .25 square inch.
Length 6".

Applied loads. Total.	Applied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
500	2,000	.000100	.000100	0.	.....	
750	3,000	.000167	.000067	0.	.....	
1,000	4,000	.000217	.000050	0.	.....	
1,250	5,000	.000250	.000033	0.	.....	
1,500	6,000	.000300	.000050	0.	.....	
1,750	7,000	.000350	.000050	0.	.....	
2,000	8,000	.000400	.000050	0.	.....	
2,250	9,000	.000433	.000033	.000033	.000033	
2,500	10,000	.000500	.000067	.000067	.000034	
2,750	11,000	.000550	.000050	.000067	0.	
3,000	12,000	.000600	.000050	.000083	.000016	
3,250	13,000	.000667	.000067	.000083	0.	
3,500	14,000	.000733	.000066	.000100	.000017	
3,750	15,000	.000800	.000067	.000100	0.	
4,000	16,000	.000883	.000083	.000133	.000033	
4,250	17,000	.000933	.000050	.000150	.000017	
4,500	18,000	.001050	.000117	.000183	.000033	
4,750	19,000	.001133	.000083	.000250	.000067	
5,000	20,000	.001283	.000150	.000317	.000067	
5,250	21,000	.001400	.000117	.000383	.000066	
5,500	22,000	.001550	.000150	.000467	.000084	
5,750	23,000	.001767	.000217	.000583	.000116	
6,000	24,000	.002033	.000266	.000783	.000200	
6,250	25,000	.002417	.000384	.001067	.000284	
7,180	28,720	.....	.....	.....	.....	Tensile strength.

Fractured at middle of stem.
Character of broken surface, uniform granulation.

No. 1122.

Marks, $\frac{12''\ H\ \&\ T}{C}$ No. 2
Diameter, ".564.
Sectional area, .25 square inch.
Length, 6".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
500	2,000	.000050	.000050	0.	.....	
750	3,000	.000083	.000033	0.	.....	
1,000	4,000	.000133	.000050	0.	.....	
1,250	5,000	.000183	.000050	0	.....	
1,500	6,000	.000233	.000050	0.	.....	
1,750	7,000	.000267	.000034	0.	.....	
2,000	8,000	.000350	.000083	0.	.....	
2,250	9,000	.000417	.000067	.000017	.000017	
2,500	10,000	.000467	.000050	.000017	0.	
2,750	11,000	.000517	.000050	.000033	.000016	
3,000	12,000	.000550	.000033	.000033	0.	
3,250	13,000	.000617	.000067	.000050	.000017	
3,500	14,000	.000667	.000050	.000067	.000017	
3,750	15,000	.000717	.000050	.000083	.000016	
4,000	16,000	.000817	.000100	.000100	.000017	
4,250	17,000	.000933	.000116	.000133	.000033	
4,500	18,000	.001000	.000067	.000167	.000034	
4,750	19,000	.001067	.000067	.000200	.000033	
5,000	20,000	.001267	.000200	.000283	.000083	
5,250	21,000	.001367	.000100	.000350	.000067	
5,500	22,000	.001567	.000200	.000467	.000117	
5,750	23,000	.001700	.000133	.000567	.000100	
6,000	24,000	.002067	.000367	.000800	.000233	
6,250	25,000	.002300	.000233	.001017	.000217	
7,190	28,760	.....	.....	.....	.....	Tensile strength.

Fractured 1 inch from neck.
Character of broken surface, uniform granulation.

No. 544.

Marks, $\frac{12''\ H\ \&\ T}{C}$ No. 3
Length, 12″.
Diameter, 1″.129.
Sectional area, 1 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000070	.000070	0.		
3,000	3,000	.000120	.000050	.000010	.000010	
4,000	4,000	.000170	.000050	.000010	0.	
5,000	5,000	.000220	.000050	.000010	0.	
6,000	6,000	.000260	.000040	.000010	0.	
7,000	7,000	.000290	.000030	.000010	0.	
8,000	8,000	.000330	.000040	.000010	0.	
9,000	9,000	.000380	.000050	.000010	0.	
10,000	10,000	.000430	.000050	.000020	.000010	
11,000	11,000	.000480	.000050	.000020	0.	
12,000	12,000	.000530	.000050	.000030	.000010	
13,000	13,000	.000580	.000050	.000040	.000010	
14,000	14,000	.000630	.000050	.000050	.000010	
15,000	15,000	.000680	.000050	.000060	.000010	
16,000	16,000	.000730	.000050	.000070	.000010	
17,000	17,000	.000780	.000050	.000070	0.	
18,000	18,000	.000850	.000070	.000080	.000010	
19,000	19,000	.000900	.000050	.000080	0.	
20,000	20,000	.000980	.000080	.000100	.000020	
21,000	21,000	.001030	.000050	.000110	.000010	
22,000	22,000	.001090	.000060	.000120	.000010	
23,000	23,000	.001170	.000080	.000140	.000020	
24,000	24,000	.001240	.000070	.000180	.000040	
25,000	25,000	.001320	.000080	.000210	.000030	
26,000	26,000	.001440	.000120	.000260	.000050	
27,000	27,000	.001560	.000120	.000300	.000040	
28,000	28,000	.001680	.000120	.000390	.000090	
29,000	29,000	.001820	.000140	.000480	.000090	
30,000	30,000	.001970	.000150	.000590	.000110	
31,000	31,000	.002240	.000270	.000790	.000200	
32,000	32,000	.002470	.000230	.000960	.000170	
33,000	33,000	.002770	.000300	.001220	.000260	
34,000	34,000	.003150	.000380	.001570	.000350	
35,000	35,000	.003620	.000470	.001960	.000290	
36,000	36,000	.003910	.000290	.002250	.000290	
37,000	37,000	.004290	.000380	.002570	.000320	
38,000	38,000	.004860	.000570	.003020	.000450	
39,000	39,000	.005310	.000450	.003440	.000420	
40,000	40,000	.005920	.000610	.003990	.000550	
51,450	51,450					Ultimate strength.

Manner of failure, triple flexure.

No. 545.

Marks, $\frac{12''\ H\ \&\ T}{C}$ No. 4
Length, 12″.
Diameter, 1″.129.
Sectional area, 1 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000060	.000060	0.	.....	
3,000	3,000	.000100	.000040	0.	.....	
4,000	4,000	.000140	.000040	0.	.....	
5,000	5,000	.000180	.000040	0.	.....	
6,000	6,000	.000220	.000040	0.	.....	
7,000	7,000	.000270	.000050	0.	.....	
8,000	8,000	.000320	.000050	0.	.....	
9,000	9,000	.000370	.000050	0.	.....	
10,000	10,000	.000420	.000050	0.	.....	
11,000	11,000	.000460	.000040	0.	.....	
12,000	12,000	.000510	.000050	.000010	.000010	
13,000	13,000	.000560	.000050	.000010	0.	
14,000	14,000	.000610	.000050	.000010	0.	
15,000	15,000	.000660	.000050	.000020	.000010	
16,000	16,000	.000710	.000050	.000030	.000010	
17,000	17,000	.000760	.000050	.000030	0.	
18,000	18,000	.000810	.000050	.000040	.000010	
19,000	19,000	.000870	.000060	.000050	.000010	
20,000	20,000	.000930	.000060	.000070	.000020	
21,000	21,000	.001000	.000070	.000090	.000020	
22,000	22,000	.001070	.000070	.000100	.000010	
23,000	23,000	.001140	.000070	.000130	.000030	
24,000	24,000	.001230	.000090	.000160	.000030	
25,000	25,000	.001320	.000090	.000200	.000040	
26,000	26,000	.001420	.000100	.000240	.000040	
27,000	27,000	.001520	.000100	.000300	.000060	
28,000	28,000	.001640	.000120	.000370	.000070	
29,000	29,000	.001780	.000140	.000490	.000120	
30,000	30,000	.001970	.000190	.000610	.000120	
31,000	31,000	.002220	.000250	.000770	.000160	
32,000	32,000	.002460	.000240	.000970	.000200	
33,000	33,000	.002770	.000310	.001230	.000260	
34,000	34,000	.003110	.000340	.001520	.000290	
35,000	35,000	.003520	.000410	.001880	.000360	
36,000	36,000	.003970	.000450	.002270	.000390	
37,000	37,000	.004420	.000450	.002680	.000410	
38,000	38,000	.005020	.000600	.003210	.000530	
39,000	39,000	.005580	.000560	.003680	.000470	
40,000	40,000	.006380	.000800	.004420	.000740	
49,900	49,900	.....	.....	.....	.....	Ultimate strength.

Manner of failure, triple flexure.

No. 546.

Marks, $\frac{12''\ H\ \&\ T}{C}$ No. 5
Length 12″.
Diameter, 1″.129.
Sectional area, 1 square inch.

Applied loads. Total.	Applied loads. Per square inch.	Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
0.	0.	0.	0.	0.	0.	Initial load.
1,000	1,000	.000060	.000060	0.		
2,000	2,000	.000110	.000050	0.		
3,000	3,000	.000140	.000030	0.		
4,000	4,000	.000190	.000050	0.		
5,000	5,000	.000220	.000030	0.		
6,000	6,000	.000270	.000050	0.		
7,000	7,000	.000320	.000050	0.		
8,000	8,000	.000370	.000050	0.		
9,000	9,000	.000420	.000050	.000010	.000010	
10,000	10,000	.000470	.000050	.000010	0.	
11,000	11,000	.000520	.000050	.000010	0.	
12,000	12,000	.000570	.000050	.000010	0.	
13,000	13,000	.000620	.000050	.000020	.000010	
14,000	14,000	.000670	.000050	.000020	0.	
15,000	15,000	.000720	.000050	.000030	.000010	
16,000	16,000	.000770	.000050	.000030	0.	
17,000	17,000	.000820	.000050	.000040	.000010	
18,000	18,000	.000870	.000050	.000060	.000020	
19,000	19,000	.000930	.000060	.000070	.000010	
20,000	20,000	.001010	.000080	.000080	.000010	
21,000	21,000	.001070	.000060	.000090	.000010	
22,000	22,000	.001130	.000060	.000100	.000010	
23,000	23,000	.001190	.000060	.000140	.000040	
24,000	24,000	.001300	.000110	.000170	.000030	
25,000	25,000	.001400	.000100	.000220	.000050	
26,000	26,000	.001480	.000080	.000270	.000050	
27,000	27,000	.001570	.000090	.000320	.000050	
28,000	28,000	.001730	.000160	.000430	.000110	
29,000	29,000	.001890	.000160	.000540	.000110	
30,000	30,000	.002100	.000210	.000700	.000160	
31,000	31,000	.002370	.000270	.000910	.000210	
32,000	32,000	.002670	.000300	.001150	.000240	
33,000	33,000	.003030	.000360	.001470	.000320	
34,000	34,000	.003420	.000390	.001890	.000420	
35,000	35,000	.003820	.000400	.002160	.000270	
36,000	36,000	.004210	.000390	.002510	.000350	
37,000	37,000	.004790	.000580	.003020	.000510	
38,000	38,000	.005280	.000490	.003450	.000430	
39,000	39,000	.005800	.000520	.003880	.000430	
40,100	40,100	.....	.....	.....	.....	Ultimate strength.

Manner of failure, triple flexure.

No. 547.

Marks, $\frac{12''\ H\ \&\ T}{C}$ No. 6
Length, 9″.
Diameter, 1″.129.
Sectional area, 1 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000067	.000067	0.	.....	
3,000	3,000	.000117	.000050	0.	.....	
4,000	4,000	.000167	.000050	.000017	.000017	
5,000	5,000	.000217	.000050	.000017	0.	
6,000	6,000	.000267	.000050	.000033	.000016	
7,000	7,000	.000317	.000050	.000033	0.	
8,000	8,000	.000350	.000033	.000033	0.	
9,000	9,000	.000383	.000033	.000033	0.	
10,000	10,000	.000433	.000050	.000050	.000017	
11,000	11,000	.000467	.000034	.000050	0.	
12,000	12,000	.000533	.000066	.000050	0.	
13,000	13,000	.000567	.000034	.000050	0.	
14,000	14,000	.000617	.000050	.000067	.000017	
15,000	15,000	.000683	.000066	.000067	0.	
16,000	16,000	.000733	.000050	.000083	.000016	
17,000	17,000	.000783	.000050	.000083	0.	
18,000	18,000	.000867	.000084	.000100	.000017	
19,000	19,000	.000900	.000033	.000100	0.	
20,000	20,000	.000967	.000067	.000117	.000017	
21,000	21,000	.001050	.000083	.000133	.000016	
22,000	22,000	.001117	.000067	.000150	.000017	
23,000	23,000	.001167	.000050	.000150	0.	
24,000	24,000	.001250	.000083	.000183	.000033	
25,000	25,000	.001350	.000100	.000250	.000067	
26,000	26,000	.001467	.000117	.000300	.000050	
27,000	27,000	.001583	.000116	.000350	.000050	
28,000	28,000	.001700	.000117	.000417	.000067	
29,000	29,000	.001883	.000183	.000550	.000133	
30,000	30,000	.002050	.000167	.000667	.000117	
31,000	31,000	.002267	.000217	.000833	.000166	
32,000	32,000	.002550	.000283	.001083	.000250	
33,000	33,000	.002883	.000333	.001350	.000267	
34,000	34,000	.003217	.000334	.001650	.000300	
35,000	35,000	.003667	.000450	.002050	.000400	
36,000	36,000	.004017	.000350	.002333	.000283	
37,000	37,000	.004650	.000633	.002933	.000600	
38,000	38,000	.005133	.000483	.003383	.000450	
39,000	39,000	.005667	.000534	.003867	.000484	
40,000	40,000	.006217	.000550	.004350	.000483	
64,300	64,300	.....	.....	.....	.....	Ultimate strength.

Manner of failure, triple flexure.

No. 548.

Marks, $\frac{12''\ H\ \&\ T}{C}$ No. 7
Length, 9″.
Diameter, 1″.129.
Sectional area, 1 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	C.	0.	0.	Initial load.
2,000	2,000	.000067	.000067	0.	.....	
3,000	3,000	.000117	.000050	0.	.....	
4,000	4,000	.000167	.000050	.000017	.000017	
5,000	5,000	.000200	.000033	.000017	0.	
6,000	6,000	.000250	.000050	.000033	.000016	
7,000	7,000	.000300	.000050	.000050	.000017	
8,000	8,000	.000350	.000050	.000050	0.	
9,000	9,000	.000400	.000050	.000050	0.	
10,000	10,000	.000450	.000050	.000067	.000017	
11,000	11,000	.000483	.000033	.000067	0.	
12,000	12,000	.000533	.000050	.000083	.000016	
13,000	13,000	.000600	.000067	.000100	.000017	
14,000	14,000	.000650	.000050	.000100	0.	
15,000	15,000	.000683	.000033	.000100	0.	
16,000	16,000	.000767	.000084	.000117	.000017	
17,000	17,000	.000833	.000066	.000117	0.	
18,000	18,000	.000883	.000050	.000133	.000016	
19,000	19,000	.000933	.000050	.000133	0.	
20,000	20,000	.001000	.000067	.000150	.000017	
21,000	21,000	.001050	.000050	.000167	.000017	
22,000	22,000	.001117	.000067	.000200	.000033	
23,000	23,000	.001183	.000066	.000217	.000017	
24,000	24,000	.001267	.000084	.000250	.000033	
25,000	25,000	.001367	.000100	.000283	.000033	
26,000	26,000	.001433	.000066	.000317	.000034	
27,000	27,000	.001533	.000100	.000350	.000033	
28,000	28,000	.001700	.000167	.000450	.000100	
29,000	29,000	.001817	.000117	.000550	.000100	
30,000	30,000	.001.000	.000183	.000683	.000133	
31,000	31,000	.002250	.000250	.000867	.000184	
32,000	32,000	.002533	.000283	.001083	.000216	
33,000	33,000	.002783	.000250	.001283	.000200	
34,000	34,000	.003200	.000417	.001650	.000367	
35,000	35,000	.003550	.000350	.001950	.000300	
36,000	36,000	.004033	.000483	.002367	.000417	
37,000	37,000	.004533	.000500	.002800	.000433	
38,000	38,000	.005017	.000484	.003267	.000467	
39,000	39,000	.005533	.000516	.003750	.000483	
40,000	40,000	.005983	.000450	.004200	.000450	
66,900	66,900	.....	.....	.....	.....	Ultimate strength.

Manner of failure, triple flexure.

TENACITY SPECIMENS.

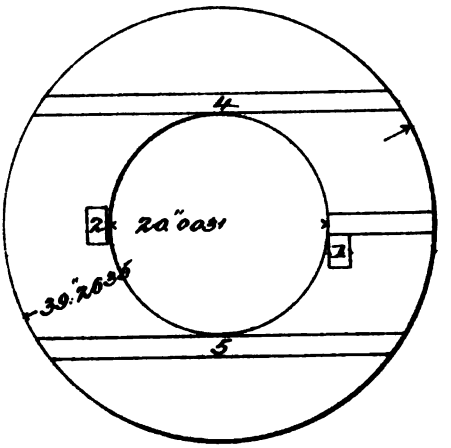
Marks, $\frac{12''\ H\ \&\ T}{C}$

No. of test.	Nos.	Diameter.	Sectional area.	Tensile strength.		Appearance of fracture.
				Total.	Pounds.	
		Inches.	*Sq. inch.*	*Pounds.*	*Per sq. inch.*	
1117	9	.564	.25	7,440	29,760	Uniform granulation.
1118	10	.564	.25	8,600	34,400	Do.

12" Cast Iron B. L. Rifle. hooped and tubed with steel.

Cast iron body. Experimental section.

2nd Slice



H Ex 31 49 2

TENACITY SPECIMENS.

Marks, $12'' \frac{H}{C} \& T$

No. of test.	Nos.	Diameter.	Sectional area.	Tensile strength.		Appearance of fracture.
				Total.	Pounds.	
		Inches.	*Sq. inch.*	*Pounds.*	*Per sq. inch.*	
2272	1	1.129	1.00	29,800	29,800	Granular, mottled.
2273	2	1.129	1.00	29,550	29,550	Do.

No. 2270.

Marks, $\frac{12''\ H\ \&\ T}{C\ 4}$

Diameter, 1″.129.

Sectional area, 1 square inch.

Length, 25″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000052	.000052	0.	.....	
3,000	3,000	.000100	.000048	0.	.....	
4,000	4,000	.000148	.000048	.000008	.000008	
5,000	5,000	.000200	.000052	.000008	0.	
6,000	6,000	.000252	.000052	.000012	.000004	
7,000	7,000	.000304	.000052	.000020	.000008	
8,000	8,000	.000356	.000052	.000028	.000008	
9,000	9,000	.000416	.000060	.000036	.000008	
10,000	10,000	.000472	.000056	.000044	.000008	
11,000	11,000	.000536	.000064	.000056	.000012	
12,000	12,000	.000600	.000064	.000068	.000012	
13,000	13,000	.000668	.000068	.000084	.000016	
14,000	14,000	.000770	.000102	.000100	.000016	
15,000	15,000	.000820	.000050	.000128	.000028	
16,000	16,000	.000904	.000084	.000156	.000028	
17,000	17,000	.000996	.000092	.000184	.000028	
18,000	18,000	.001116	.000120	.000240	.000056	
19,000	19,000	.001244	.000128	.000300	.000060	
20,000	20,000	.001380	.000136	.000372	.000072	
24,880	24,880	.....	.....	.....	.....	Tensile strength.

Fractured at neck of specimen.

Character of broken surface, granular, mottled.

No. 2271.

Marks, $\frac{12''\ H\&T}{C\ 5}$

Diameter, 1″.129.

Sectional area, 1 square inch.

Length, 25″.

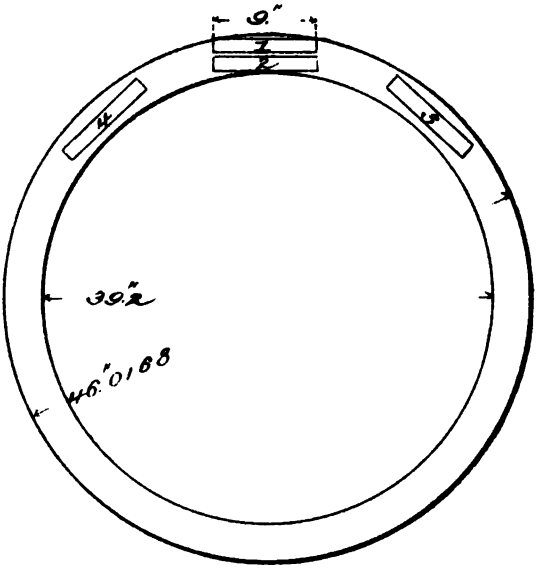
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000052	.000052	0.	.....	
3,000	3,000	.000092	.000040	0.	.....	
4,000	4,000	.000144	.000052	0.	.....	
5,000	5,000	.000188	.000044	0.	.....	
6,000	6,000	.000236	.000048	.000004	.000004	
7,000	7,000	.000284	.000048	.000008	.000004	
8,000	8,000	.000340	.000056	.000016	.000008	
9,000	9,000	.000396	.000056	.000024	.000008	
10,000	10,000	.000452	.000056	.000032	.000008	
11,000	11,000	.000508	.000056	.000040	.000008	
12,000	12,000	.000580	.000072	.000048	.000008	
13,000	13,000	.000644	.000064	.000064	.000016	
14,000	14,000	.000708	.000064	.000080	.000016	
15,000	15,000	.000792	.000084	.000104	.000024	
16,000	16,000	.000880	.000088	.000132	.000028	
17,000	17,000	.000968	.000088	.000160	.000028	
18,000	18,000	.001076	.000108	.000212	.000052	
19,000	19,000	.001204	.000128	.000272	.000060	
20,000	20,000	.001340	.000136	.000355	.000084	
27,450	27,450	.....	.....	.....	.....	Tensile strength.

Fractured 6″ from neck.

Character of broken surface, granular, mottled.

12" Cast Iron B. L. Rifle, hooped and tubed with steel.

Hoop Ax, experimental cylinder



H Ex 31 49 2

No. 1014.

Marks, $\frac{12''\ H\ T}{A}$ No. 2
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000300	.000183	0.	.....	
3,750	15,000	.000417	.000117	0.	.....	
5,000	20,000	.000583	.000166	0.	.....	
6,250	25,000	.000733	.000150	0.	.....	
7,500	30,000	.000917	.000184	0.	.....	
8,750	35,000	.001083	.000166	0.	.....	
10,000	40,000	.001250	.000167	0.	.....	
10,250	41,000	.001267	.000017	.....	.....	
10,500	42,000	.001283	.000016	.....	.....	
10,750	43,000	.001317	.000034	.....	.....	
11,000	44,000	.001367	.000050	.....	.....	
11,250	45,000	.001409	.000033	.000017	.000017	
11,500	46,000	.001417	.000017	.....	.....	
11,750	47,000	.001450	.000033	.....	.....	
12,000	48,000	.001500	.000050	.....	.....	
12,250	49,000	.001550	.000050	.....	.....	
12,500	50,000	.001600	.000050	.000033	.000016	
12,750	51,000	.001650	.000050	.....	.....	
13,000	52,000	.001700	.000050	.....	.....	
13,250	53,000	.001733	.000033	.....	.....	Elastic limit
13,500	54,000	.001800	.000067	.....	.....	
13,750	55,000	.001967	.000167	.000217	.000184	
14,000	56,000	.002250	.000283	.....	.....	
14,250	57,000	.002467	.000217	.....	.....	
14,500	58,000	.002800	.000333	.....	.....	
14,750	59,000	.003167	.000367	.....	.....	
15,000	60,000	.003517	.000350	.001617	.001400	
15,500	62,000	.004917	.001400	.....	.....	
16,000	64,000	.006083	.001166	.....	.....	
16,500	66,000	.007833	.001750	.....	.....	
17,000	68,000	.009500	.001667	.....	.....	
17,500	70,000	.011167	.001667	.....	.....	
18,000	72,000	.013083	.001916	.....	.....	
18,500	74,000	.014667	.001584	.....	.....	
19,000	76,000	.016500	.001833	.....	.....	
19,500	78,000	.018333	.001833	.....	.....	
20,000	80,000	.020333	.002000	.....	.....	
20,500	82,000	.022500	.002167	.....	.....	
21,000	84,000	.024833	.002333	.....	.....	
21,500	86,000	.027500	.002667	.....	.....	
22,000	88,000	.030133	.002633	.....	.....	
22,500	90,000	.033000	.002867	.....	.....	
23,000	92,000	.0350	.0020	.....	.....	
23,500	94,000	.0400	.0050	.....	.....	
24,000	96,000	.0450	.0050	.....	.....	
24,500	98,000	.0500	.0050	.....	.....	
25,000	100,000	.0583	.0083	.....	.....	
25,500	102,000	.0667	.0084	.....	.....	
26,000	104,000	.0850	.0183	.....	.....	
26,270	105,080	.1200	.0350	.....	.....	Tensile strength.

General summary.

Specific gravity		7.8535
Hardness		22.39
Tensile strength per square inch of original section	pounds..	105,080
Elastic limit per square inch of original section	do...	53,000
Elongation per inch after rupture	inch..	0.1467
Elongation per inch under strain at elastic limit	do...	.001733
Reduction in diameter at point of rupture	do...	.114
Reduction in area after rupture, per centum of original section		36.4
Position of rupture		1".1 from neck
Character of broken surface		granular at circumference; silky center
Elongation of inch sections		".25*, ".19, ".12, ".12, ".11, ".09

No. 1015.

Marks, $\frac{12''\ H\ T}{A}$ No. 3
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000283	.000166	0.	.....	
3,750	15,000	.000450	.000167	0.	.....	
5,000	20,000	.000583	.000133	0.	.....	
6,250	25,000	.000750	.000167	0.	.....	
7,500	30,000	.000917	.000167	0.	.....	
8,750	35,000	.001067	.000150	0.	.....	
10,000	40,000	.001233	.000166	0.	.....	
11,250	45,000	.001367	.000134	.....	.....	
11,500	46,000	.001383	.000016	.....	.....	
11,750	47,000	.001433	.000050	.....	.....	
12,000	48,000	.001483	.000050	.....	.....	
12,250	49,000	.001517	.000034	.....	.....	
12,500	50,000	.001567	.000050	0.	.....	
12,750	51,000	.001617	.000050	.....	.....	
13,000	52,000	.001367	.000050	.....	.....	
13,250	53,000	.001717	.000050	.....	.....	Elastic limit.
13,500	54,000	.001867	.000150	.....	.....	
13,750	55,000	.002017	.000150	.000217	.000217	
14,000	56,000	.002250	.000233	.....	.....	
14,250	57,000	.002433	.000183	.....	.....	
14,500	58,000	.002700	.000267	.....	.....	
14,750	59,000	.002983	.000283	.....	.....	
15,000	60,000	.003467	.000484	.001367	.001150	
15,500	62,000	.004300	.000833	.....	.....	
16,000	64,000	.006167	.001867	.....	.....	
16,500	66,000	.007667	.001500	.....	.....	
17,000	68,000	.009033	.001366	.....	.....	
17,500	70,000	.010667	.001634	.....	.....	
18,000	72,000	.012667	.002000	.....	.....	
18,500	74,000	.014167	.001500	.....	.....	
19,000	76,000	.016033	.001866	.....	.....	
19,500	78,000	.017917	.001884	.....	.....	
20,000	80,000	.020083	.002166	.....	.....	
20,500	82,000	.022167	.002084	.....	.....	
21,000	84,000	.024417	.002250	.....	.....	
21,500	86,000	.026917	.002500	.....	.....	
22,000	88,000	.029500	.002583	.....	.....	
22,500	90,000	.032250	.002750	.....	.....	
23,000	92,000	.036000	.003750	.....	.....	
23,500	94,000	.0383	.0023	.....	.....	
24,000	96,000	.0433	.0050	.....	.....	
24,500	98,000	.0483	.0050	.....	.....	
25,000	100,000	.0533	.0050	.....	.....	
25,500	102,000	.0617	.0084	.....	.....	
26,000	104,000	.0800	.0183	.....	.....	
26,320	105,280	.1133	.0333	.....	.....	,Tensile strength.

General summary.

Tensile strength per square inch of original section	**pounds..**	105,280
Elastic limit per square inch of original section	**do...**	53,000
Elongation per inch after rupture	**inch..**	0.1467
Elongation per inch under strain at elastic limit	**do...**	.001717
Reduction in diameter at point of rupture	**do...**	.114
Reduction in area after rupture, per centum of original section		36.4
Position of rupture		2″.10 from neck
Character of broken surface		granular at circumference; silky center
Elongation of inch sections		″.11, ″.29, ″.17, ″.11, ″.11, ″.09

No. 1016.

Marks, $\frac{12''\ H\ T}{A}$ No. 4
Diameter, ".564.
Sectional area, .25 square inch.

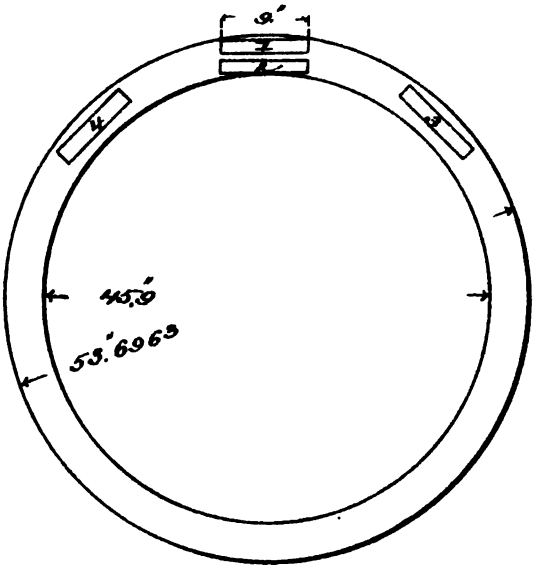
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.		
2,500	10,000	.000317	.000184	0.		
3,750	15,000	.000450	.000133	0.		
5,000	20,000	.000617	.000167	0.		
6,250	25,000	.000783	.000166	0.		
7,500	30,000	.000933	.000150	0.		
8,750	35,000	.001100	.000167	0.		
10,000	40,000	.001267	.000167	0.		
11,250	45,000	.001400	.000133	0.		
12,500	50,000	.001600	.000200	.000033	.000033	
12,750	51,000	.001650	.000050			
13,000	52,000	.001717	.000067			
13,250	53,000	.001783	.000066			Elastic limit.
13,500	54,000	.001883	.000100			
13,750	55,000	.002017	.000134	.000217	.000184	
14,000	56,000	.002200	.000183			
14,250	57,000	.002383	.000183			
14,500	58,000	.002667	.000284			
14,750	59,000	.002917	.000250			
15,000	60,000	.003333	.000416	.001250	.001033	
15,500	62,000	.004167	.000834			
16,000	64,000	.005700	.001533			
16,500	66,000	.007100	.001400			
17,000	68,000	.008917	.001817			
17,500	70,000	.010600	.001683			
18,000	72,000	.012250	.001650			
18,500	74,000	.014000	.001750			
19,000	76,000	.015750	.001750			
19,500	78,000	.017750	.002000			
20,000	80,000	.019917	.002167			
20,500	82,000	.022033	.002116			
21,000	84,000	.024333	.002300			
21,500	86,000	.026917	.002584			
22,000	88,000	.029467	.002550			
22,500	90,000	.032500	.003033			
23,000	92,000	.0350	.0025			
23,500	94,000	.0383	.0033			
24,000	96,000	.0433	.0050			
24,500	98,000	.0483	.0050			
25,000	100,000	.0550	.0067			
25,500	102,000	.0650	.0100			
26,000	104,000	.0817	.0167			
26,170	104,680	.1033	.0216			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	104,680
Elastic limit per square inch of original section	do...	53,000
Elongation per inch after rupture	inch..	0.1333
Elongation per inch under strain at elastic limit	do...	.001783
Reduction in diameter at point of rupture	do...	.124
Reduction in area after rupture, per centum of original section		39.2
Position of rupture		1."2 from neck
Character of broken surface		silky
Elongation of inch sections		".19*, ".23, ".12, ".10, ".09, ".07

12" Cast Iron B.L. Rifle, hooped and tubed with steel.

Hoop Bx Experimental section



H Ex 3.1 49 2

No. 1017.

Marks, $\frac{12''\ H\ T}{B}$ $\frac{}{No.\ 1}$

Diameter, ".564.

Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	.....	
2,500	10,000	.000300	.000133	0.	.....	
3,750	15,000	.000467	.000167	0.	.....	
5,000	20,000	.000633	.000166	.000017	.000017	
6,250	25,000	.000783	.000150	.000017	0.	
7,500	30,000	.000933	.000150	.000017	0.	
8,750	35,000	.001100	.000167	.000017	0.	
10,000	40,000	.001283	.000183	.000017	0.	
10,250	41,000	.001317	.000034	.....	.....	
10,500	42,000	.001333	.000016	.....	.....	
10,750	43,000	.001367	.000034	.....	.....	
11,000	44,000	.001383	.000016	.....	.....	
11,250	45,000	.001433	.000050	.000017	0.	
11,500	46,000	.001467	.000034	.....	.....	
11,750	47,000	.001500	.000023	.....	.....	
12,000	48,000	.001550	.000050	.....	.....	
12,250	49,000	.001583	.000033	.....	.....	
12,500	50,000	.001617	.000034	.000017	.000034	
12,750	51,000	.001650	.000033	.....	.....	
13,000	52,000	.001683	.000033	.....	.....	Elastic limit.
13,250	53,000	.001767	.000084	.....	.....	
13,500	54,000	.001850	.000083	.....	.....	
13,750	55,000	.001933	.000083	.000133	.000116	
14,000	56,000	.002383	.000450	.....	.....	
14,250	57,000	.002817	.000434	.....	.....	
14,500	58,000	.003717	.000900	.....	.....	
14,750	59,000	.004333	.000616	.....	.....	
15,000	60,000	.004933	.000600	.002717	.002584	
15,500	62,000	.005783	.000850	.....	.....	
16,000	64,000	.007833	.002050	.....	.....	
16,500	66,000	.009750	.001917	.....	.....	
17,000	68,000	.011300	.001550	.....	.....	
17,500	70,000	.012750	.001450	.....	.....	
18,000	72,000	.014667	.001917	.....	.....	
18,500	74,000	.016167	.001500	.....	.....	
19,000	76,000	.018167	.002000	.....	.....	
19,500	78,000	.020133	.001966	.....	.....	
20,000	80,000	.022333	.002200	.....	.....	
20,500	82,000	.024350	.002017	.....	.....	
21,000	84,000	.026800	.002450	.....	.....	
21,500	86,000	.029500	.002700	.....	.....	
22,000	88,000	.032517	.003017	.....	.....	
22,500	90,000	.035600	.003083	.....	.....	
23,000	92,000	.0383	.0027	.....	.....	
23,500	94,000	.0433	.0050	.....	.....	
24,000	96,000	.0483	.0050	.....	.....	
24,500	98,000	.0533	.0050	.....	.....	
25,000	100,000	.0633	.0100	.....	.....	
25,500	102,000	.0800	.0167	.....	.....	
25,880	103,520	.1233	.0433	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	103,520
Elastic limit per square inch of original section	do...	52,000
Elongation per inch after rupture	inch..	0.1433
Elongation per inch under strain at elastic limit	do...	.001683
Reduction in diameter at point of rupture	do...	.124
Reduction in area after rupture, per centum of original section		39.2
Position of rupture		".70 from middle of stem
Character of broken surface		silky; with ring of granular mteal near circumference
Elongation of inch sections		".10, ".13, ".32*, ".12, ".11, ".08

No. 1018.

Marks, $\frac{12''\ H\ \&\ T}{B}$ No. 2
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.		
2,500	10,000	.000317	.000184	0.		
3,750	15,000	.000433	.000116	0.		
5,000	20,000	.000600	.000167	0.		
6,250	25,000	.000767	.000167	0.		
7,500	30,000	.000933	.000166	0.		
8,750	35,000	.001117	.000184	0.		
10,000	40,000	.001250	.000133	0.		
10,250	41,000	.001283	.000033			
10,500	42,000	.001317	.000034			
10,750	43,000	.001350	.000033			
11,000	44,000	.001400	.000050			
11,250	45,000	.001450	.000050	.0		
11,500	46,000	.001500	.000050			
11,750	47,000	.001517	.000017			
12,000	48,000	.001550	.000033			
12,250	49,000	.001583	.000033			
12,500	50,000	.001617	.000034	.000017	.000017	
12,750	51,000	.001667	.000050			
13,000	52,000	.001683	.000016			
13,250	53,000	.001733	.000050			Elastic limit.
13,500	54,000	.001800	.000067			
13,750	55,000	.001900	.000100	.000117	.000100	
14,000	56,000	.002083	.000183			
14,250	57,000	.002450	.000367			
14,500	58,000	.003150	.000700			
14,750	59,000	.003583	.000433			
15,000	60,000	.004733	.001150	.002500	.002383	
15,500	62,000	.006000	.001267			
16,000	64,000	.007500	.001500			
16,500	66,000	.009167	.001667			
17,000	68,000	.010833	.001666			
17,500	70,000	.012250	.001417			
18,000	72,000	.013933	.001683			
18,500	74,000	.015783	.001850			
19,000	76,000	.017217	.001434			
19,500	78,000	.019400	.002183			
20,000	80,000	.021333	.001933			
20,500	82,000	.023417	.002084			
21,000	84,000	.025500	.002083			
21,500	86,000	.028450	.002950			
22,000	88,000	.031333	.002883			
22,500	90,000	.034000	.002667			
23,000	92,000	.0367	.0027			
23,500	94,000	.0400	.0033			
24,000	96,000	.0450	.0050			
24,500	98,000	.0517	.0067			
25,000	100,000	.0583	.0066			
25,500	102,000	.0717	.0134			
26,000	104,000	.0883	.0166			
26,150	104,600	.1133	.0250			Tensile strength.

General summary.

Specific gravity	7.8543
Hardness	22.14
Tensile strength per square inch of original section ..... pounds..	104,600
Elastic limit per square inch of original section ..... do...	53,000
Elongation per inch after rupture ..... inch..	0.1583
Elongation per inch under strain at elastic limit ..... do...	.001733
Reduction in diameter at point of rupture ..... do...	.114
Reduction in area after rupture, per centum of original section	36.4
Position of rupture	".8 from middle of stem
Character of broken surface	granular; dull silky center
Elongation of inch sections	".12, ".18, ".32*, ".13, ".11, ".09

No. 1019.

Marks, $\frac{12''\ H\ T}{B}$ No. 3

Diameter, ".564.

Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	.....	
2,500	10,000	.000317	.000150	0.	.....	
3,750	15,000	.000483	.000166	0.	.....	
5,000	20,000	.000667	.000184	0.	.....	
6,250	25,000	.000833	.000166	0.	.....	
7,500	30,000	.001000	.000167	.000017	.000017	
8,750	35,000	.001150	.000150	.000033	.000016	
10,000	40,000	.001317	.000167	.000033	0.	
10,250	41,000	.001333	.000016	.....	.....	
10,500	42,000	.001367	.000034	.....	.....	
10,750	43,000	.001383	.000016	.....	.....	
11,000	44,000	.001433	.000050	.....	.....	
11,250	45,000	.001467	.000034	.....	.....	
11,500	46,000	.001500	.000033	.....	.....	
11,750	47,000	.001533	.000033	.....	.....	
12,000	48,000	.001567	.000034	.....	.....	Elastic limit.
12,250	49,000	.001617	.000050	.....	.....	
12,500	50,000	.001700	.000083	.000117	.000081	
12,750	51,000	.001800	.000100	.....	.....	
13,000	52,000	.001900	.000100	.....	.....	
13,250	53,000	.002417	.000517	.....	.....	
13,500	54,000	.003117	.000700	.....	.....	
13,750	55,000	.003650	.000533	.001650	.001533	
14,000	56,000	.004183	.000533	.....	.....	
14,250	57,000	.004583	.000400	.....	.....	
14,500	58,000	.005500	.000917	.....	.....	
14,750	59,000	.006183	.000683	.....	.....	
15,000	60,000	.006700	.000517	.004467	.002817	
15,500	62,000	.008083	.001383	.....	.....	
16,000	64,000	.009667	.001584	.....	.....	
16,500	66,000	.011400	.001733	.....	.....	
17,000	68,000	.012867	.001467	.....	.....	
17,500	70,000	.014600	.001733	.....	.....	
18,000	72,000	.016417	.001817	.....	.....	
18,500	74,000	.018167	.001750	.....	.....	
19,000	76,000	.020000	.001833	.....	.....	
19,500	78,000	.022300	.002300	.....	.....	
20,000	80,000	.024500	.002200	.....	.....	
20,500	82,000	.026867	.002367	.....	.....	
21,000	84,000	.029583	.002716	.....	.....	
21,500	86,000	.032333	.002750	.....	.....	
22,000	88,000	.035333	.003000	.....	.....	
22,500	90,000	.0367	.001367	.....	.....	
23,000	92,000	.0400	.0033	.....	.....	
23,500	94,000	.0467	.0067	.....	.....	
24,000	96,000	.0533	.0066	.....	.....	
24,500	98,000	.0617	.0084	.....	.....	
25,000	100,000	.0717	.0100	.....	.....	
25,500	102,000	.1300	.0583	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	102,000
Elastic limit per square inch of original section	do...	48,000
Elongation per inch after rupture	inch..	0.1550
Elongation per inch under strain at elastic limit	do...	.001567
Reduction in diameter at point of rupture	do...	.114
Reduction in area after rupture, per centum of original section		36.4
Position of rupture		¾ inch from middle of stem
Character of broken surface		silky; with ring of granular metal at circumference
Elongation of inch sections		".11, ".17, ".32*, ".14, ".11, ".08

No. 1020.

Marks, $\frac{12''HT}{B}$ No. 4
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000250	.000133	0.	.....	
3,750	15,000	.000450	.000200	0.	.....	
5,000	20,000	.000583	.000133	0.	.....	
6,250	25,000	.000717	.000134	0.	.....	
7,500	30,000	.000917	.000200	0.	.....	
8,750	35,000	.001050	.000133	0.	.....	
10,000	40,000	.001250	.000200	0.	.....	
10,250	41,000	.001267	.000017	.....	.....	
10,500	42,000	.001283	.000016	.....	.....	
10,750	43,000	.001317	.000034	.....	.....	
11,000	44,000	.001367	.000050	.....	.....	
11,250	45,000	.001400	.000033	0.	.....	
11,500	46,000	.001450	.000050	.....	.....	
11,750	47,000	.001467	.000017	.....	.....	
12,000	48,000	.001483	.000016	.....	.....	
12,250	49,000	.001533	.000050	.....	.....	Elastic limit.
12,500	50,000	.001600	.000067	.000033	.000033	
12,750	51,000	.001717	.000117	.....	.....	
13,000	52,000	.001900	.000183	.....	.....	
13,250	53,000	.002167	.000267	.....	.....	
13,500	54,000	.003467	.001300	.....	.....	
13,750	55,000	.004233	.000766	.002233	.002200	
14,000	56,000	.005067	.000834	.....	.....	
14,250	57,000	.005233	.000166	.....	.....	
14,500	58,000	.005833	.000600	.....	.....	
14,750	59,000	.007000	.001167	.....	.....	
15,000	60,000	.007917	.000917	.005617	.003384	
15,500	62,000	.008917	.001000	.....	.....	
16,000	64,000	.010583	.001666	.....	.....	
16,500	66,000	.012567	.001984	.....	.....	
17,000	68,000	.013933	.001366	.....	.....	
17,500	70,000	.016333	.002400	.....	.....	
18,000	72,000	.018167	.001834	.....	.....	
18,500	74,000	.020083	.001916	.....	.....	
19,000	76,000	.021667	.001584	.....	.....	
19,500	78,000	.024583	.002916	.....	.....	
20,000	80,000	.027333	.002750	.....	.....	
20,500	82,000	.029250	.001917	.....	.....	
21,000	84,000	.032000	.002750	.....	.....	
21,500	86,000	.036000	.004000	.....	.....	
22,000	88,000	.0367	.0007	.....	.....	
22,500	90,000	.0433	.0066	.....	.....	
23,000	92,000	.0483	.0050	.....	.....	
23,500	94,000	.0517	.0034	.....	.....	
24,000	96,000	.0617	.0100	.....	.....	
24,500	98,000	.0750	.0133	.....	.....	
25,000	100,000	.1000	.0250	.....	.....	
25,100	100,400	.1317	.0317	.....	.....	Tensile strength.

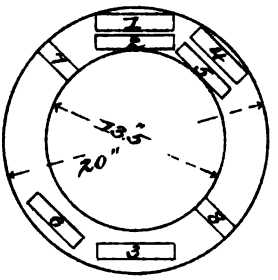
General summary.

Tensile strength per square inch of original section	pounds..	100,400
Elastic limit per square inch of original section	do...	49,000
Elongation per inch after rupture	inch..	0.1567
Elongation per inch under strain at elastic limit	do...	.001533
Reduction in diameter at point of rupture	do...	.124
Reduction in area after rupture, per centum of original section		39.2
Position of rupture		1".2 from neck
Character of broken surface		silky center; granular at circumference
Elongation of inch sections		".28", ".22, ".13, ".11, ".11, ".09

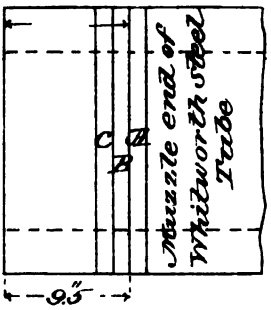
12" Cast Iron B.L. Rifle, hooped and tubed with steel.

Experimental cylinder. Tube section.

Test ring B



Experimental section



A Original test ring before hooping

B 1st test ring after unhooping

C 2nd " " " "

H Ex 31 49 2

No. 1023.

Marks, $\frac{12\ H\ \&\ T}{No.\ 1}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.		
2,500	10,000	.000333	.000166	0.		
3,750	15,000	.000500	.000167	0.		
5,000	20,000	.000667	.000167	0.		
6,250	25,000	.000867	.000200	.000033	.000033	
7,500	30,000	.001033	.000166	.000033	0.	
8,750	35,000	.001200	.000167	.000033	0.	
10,000	40,000	.001367	.000167	.000067	.000034	
11,250	45,000	.001533	.000166	.000100	.000033	
12,500	50,000	.001700	.000167	.000133	.000033	
12,750	51,000	.001733	.000033			
13,000	52,000	.001767	.000034			Elastic limit.
13,250	53,000	.001867	.000100			
13,500	54,000	.003333	.001466			
13,750	55,000	.009333	.006000	.007000	.006867	
14,000	56,000	.009667	.000334			
14,250	57,000	.010333	.000666			
14,500	58,000	.010667	.000334			
14,750	59,000	.011233	.000566			
15,000	60,000	.011933	.000700	.009433	.002433	
15,500	62,000	.013433	.001500			
16,000	64,000	.015100	.001667			
16,500	66,000	.017000	.001900			
17,000	68,000	.019167	.002167			
17,500	70,000	.021667	.002500			
18,000	72,000	.024233	.002566			
18,500	74,000	.026667	.002434			
19,000	76,000	.028933	.002266			
19,500	78,000	.032167	.003234			
20,000	80,000	.035267	.003100			
20,500	82,000	.039100	.003833			
21,000	84,000	.043333	.004233			
21,500	86,000	.048433	.005100			
22,000	88,000	.054667	.006234			
22,500	90,000	.062167	.007500			
23,000	92,000	.0733	.011133			
23,500	94,000	.0933	.0200			
24,000	96,000	.1267	.0334			
24,100	96,400	.1500	.0233			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	96,400
Elastic limit per square inch of original section	do...	52,000
Elongation per inch after rupture	inch..	0.2033
Elongation per inch under strain at elastic limit	do...	.001767
Reduction in diameter at point of rupture	do...	.124
Reduction in area after rupture, per centum of original section		39.2
Position of rupture		1″.2 from neck
Character of broken surface		silky
Elongation of inch sections		″.26*, ″.24, ″.11

No. 1024.

Marks, $\frac{12''\ H\ \&\ T}{No.\ 2}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167			
2,500	10,000	.000333	.000166			
3,750	15,000	.000500	.000167			
5,000	20,000	.000667	.000167			
6,250	25,000	.000833	.000166			
7,500	30,000	.001033	.000200	.000033	.000033	
8,750	35,000	.001167	.000134	.000033	0.	
10,000	40,000	.001333	.000166	.000067	.000034	
11,250	45,000	.001533	.000200			
11,500	46,000	.001567	.000034			
11,750	47,000	.001600	.000033			
12,000	48,000	.001633	.000033			Elastic limit.
12,250	49,000	.003667	.002034			
12,500	50,000	.006767	.003100	.004767	.004700	
12,750	51,000	.007100	.000333			
13,000	52,000	.007600	.000500			
13,250	53,000	.008100	.000500			
13,500	54,000	.009200	.001100			
13,750	55,000	.009767	.000567	.007467	.002700	
14,000	56,000	.010667	.000900			
14,250	57,000	.011367	.000700			
14,500	58,000	.012233	.000866			
14,750	59,000	.013067	.000834			
15,000	60,000	.013967	.000900	.011467	.004000	
15,500	62,000	.015733	.001766			
16,000	64,000	.017833	.002100			
16,500	66,000	.020033	.002200			
17,000	68,000	.022667	.002634			
17,500	70,000	.025067	.002400			
18,000	72,000	.027533	.002466			
18,500	74,000	.030433	.002900			
19,000	76,000	.033733	.003300			
19,500	78,000	.037400	.003667			
20,000	80,000	.041867	.004467			
20,500	82,000	.047067	.005200			
21,000	84,000	.052667	.005600			
21,500	86,000	.059300	.006633			
22,000	88,000	.0700	.0107			
22,500	90,000	.0867	.0167			
22,950	91,800					Tensile strength.

General summary.

Specific gravity		7.8667
Hardness		16.31
Tensile strength per square inch of original section	pounds	91,800
Elastic limit per square inch of original section	do	48,000
Elongation per inch after rupture	inch	0.1033
Elongation per inch under strain at elastic limit	do	.001633
Reduction in diameter at point of rupture	do	.034
Reduction in area after rupture, per centum of original section		11.8
Position of rupture		⅜ inch from middle of stem
Character of broken surface	granular; fractured at defective spot in the metal	
Elongation of inch sections		".10, " 12", ".09

No. 1025.

Marks, $\frac{12''\ H\ \&\ T}{No.\ 3}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	.....	
2,500	10,000	.000300	.000133	0.	.....	
3,750	15,000	.000500	.000200	0.	.....	
5,000	20,000	.000667	.000167	0.	.....	
6,250	25,000	.000833	.000166	0.	.....	
7,500	30,000	.001000	.000167	.000033	.000033	
8,750	35,000	.001167	.000167	.000033	0.	
10,000	40,000	.001400	.000233	.000067	.000034	
11,250	45,000	.001600	.000200	.000067	0.	
11,500	46,000	.001633	.000033	.....	.....	
11,750	47,000	.001667	.000034	.....	.....	
12,000	48,000	.001733	.000066	.....	.....	Elastic limit.
12,250	49,000	.001867	.000134	.....	.....	
12,500	50,000	.007833	.005966	.005767	.005700	
12,750	51,000	.008167	.000334	.....	.....	
13,000	52,000	.008667	.000500	.....	.....	
13,250	53,000	.009000	.000333	.....	.....	
13,500	54,000	.009933	.000933	.....	.....	
13,750	55,000	.010700	.000767	.008367	.002600	
14,000	56,000	.011667	.000967	.....	.....	
14,250	57,000	.012367	.000700	.....	.....	
14,500	58,000	.013267	.000900	.....	.....	
14,750	59,000	.014033	.000766	.....	.....	
15,000	60,000	.015367	.001334	.012700	.004333	
15,500	62,000	.017167	.001800	.....	.....	
16,000	64,000	.019000	.001833	.....	.....	
16,500	66,000	.021667	.002667	.....	.....	
17,000	68,000	.024067	.002400	.....	.....	
17,500	70,000	.026732	.002666	.....	.....	
18,000	72,000	.029667	.002934	.....	.....	
18,500	74,000	.032700	.003033	.....	.....	
19,000	76,000	.036333	.003633	.....	.....	
19,500	78,000	.040000	.003667	.....	.....	
20,000	80,000	.044700	.004700	.....	.....	
20,500	82,000	.050000	.005300	.....	.....	
21,000	84,000	.057000	.007000	.....	.....	
21,500	86,000	.064067	.007667	.....	.....	
22,000	88,000	.076333	.011666	.....	.....	
22,500	90,000	.0967	.020367	.....	.....	
23,000	92,000	.1200	.0233	.....	.....	
23,200	92,800	.1500	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	92,800
Elastic limit per square inch of original section	do...	48,000
Elongation per inch after rupture	inch..	0.2300
Elongation per inch under strain at elastic limit	do...	001733
Reduction in diameter at point of rupture	do ..	.134
Reduction in area after rupture, per centum of original section		41.9
Position of rupture		½ inch from middle of stem
Character of broken surface		silky
Elongation of inch sections		".15, ".35*, ".16

No. 1024.

Marks, $\frac{12''\ H\ \&\ T}{No.\ 2}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167			
2,500	10,000	.000333	.000166			
3,750	15,000	.000500	.000167			
5,000	20,000	.000667	.000167			
6,250	25,000	.000833	.000166			
7,500	30,000	.001033	.000200	.000033	.000033	
8,750	35,000	.001167	.000134	.000033	0.	
10,000	40,000	.001333	.000166	.000067	.000034	
11,250	45,000	.001533	.000200			
11,500	46,000	.001567	.000034			
11,750	47,000	.001600	.000033			
12,000	48,000	.001633	.000033			Elastic limit.
12,250	49,000	.003667	.002034			
12,500	50,000	.006767	.003100	.004767	.004700	
12,750	51,000	.007100	.000333			
13,000	52,000	.007600	.000500			
13,250	53,000	.008100	.000500			
13,500	54,000	.009200	.001100			
13,750	55,000	.009767	.000567	.007467	.002700	
14,000	56,000	.010667	.000900			
14,250	57,000	.011367	.000700			
14,500	58,000	.012233	.000866			
14,750	59,000	.013067	.000834			
15,000	60,000	.013967	.000900	.011467	.004000	
15,500	62,000	.015733	.001766			
16,000	64,000	.017833	.002100			
16,500	66,000	.020033	.002200			
17,000	68,000	.022667	.002634			
17,500	70,000	.025067	.002400			
18,000	72,000	.027533	.002466			
18,500	74,000	.030433	.002900			
19,000	76,000	.033733	.003300			
19,500	78,000	.037400	.003667			
20,000	80,000	.041867	.004467			
20,500	82,000	.047067	.005200			
21,000	84,000	.052667	.005600			
21,500	86,000	.059300	.006633			
22,000	88,000	.0700	.0107			
22,500	90,000	.0867	.0167			
22,950	91,800					Tensile strength.

General summary.

Specific gravity		7.8667
Hardness		16.31
Tensile strength per square inch of original section	pounds	91,800
Elastic limit per square inch of original section	do	48,000
Elongation per inch after rupture	inch	0.1033
Elongation per inch under strain at elastic limit	do	.001633
Reduction in diameter at point of rupture	do	.034
Reduction in area after rupture, per centum of original section		11.8
Position of rupture		½ inch from middle of stem
Character of broken surface	granular; fractured at defective spot in the metal	
Elongation of inch sections		".10, " 12", ".09

No. 1025.

Marks, $\frac{12''\ H\ \&\ T}{No.\ 3}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	.....	
2,500	10,000	.000300	.000133	0.	.....	
3,750	15,000	.000500	.000200	0.	.....	
5,000	20,000	.000667	.000167	0.	.....	
6,250	25,000	.000833	.000166	0.	.....	
7,500	30,000	.001000	.000167	.000033	.000033	
8,750	35,000	.001167	.000167	.000033	0.	
10,000	40,000	.001400	.000233	.000067	.000034	
11,250	45,000	.001600	.000200	.000067	0.	
11,500	46,000	.001633	.000033	.....	.....	
11,750	47,000	.001667	.000034	.....	.....	
12,000	48,000	.001733	.000066	.....	.....	Elastic limit.
12,250	49,000	.001867	.000134	.....	.....	
12,500	50,000	.007833	.005966	.005767	.005700	
12,750	51,000	.008167	.000334	.....	.....	
13,000	52,000	.008667	.000500	.....	.....	
13,250	53,000	.009000	.000333	.....	.....	
13,500	54,000	.009933	.000933	.....	.....	
13,750	55,000	.010700	.000767	.008367	.002600	
14,000	56,000	.011667	.000967	.....	.....	
14,250	57,000	.012367	.000700	.....	.....	
14,500	58,000	.013267	.000900	.....	.....	
14,750	59,000	.014033	.000766	.....	.....	
15,000	60,000	.015367	.001334	.012700	.004333	
15,500	62,000	.017167	.001800	.....	.....	
16,000	64,000	.019000	.001833	.....	.....	
16,500	66,000	.021667	.002667	.....	.....	
17,000	68,000	.024067	.002400	.....	.....	
17,500	70,000	.026732	.002666	.....	.....	
18,000	72,000	.029667	.002934	.....	.....	
18,500	74,000	.032700	.003033	.....	.....	
19,000	76,000	.036333	.003633	.....	.....	
19,500	78,000	.040000	.003667	.....	.....	
20,000	80,000	.044700	.004700	.....	.....	
20,500	82,000	.050000	.005300	.....	.....	
21,000	84,000	.057000	.007000	.....	.....	
21,500	86,000	.064667	.007667	.....	.....	
22,000	88,000	.076333	.011666	.....	.....	
22,500	90,000	.0967	.020367	.....	.....	
23,000	92,000	.1200	.0233	.....	.....	
23,200	92,800	.1500	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	92,800
Elastic limit per square inch of original section	do...	48,000
Elongation per inch after rupture	inch..	0.2200
Elongation per inch under strain at elastic limit	do...	001733
Reduction in diameter at point of rupture	do ..	.134
Reduction in area after rupture, per centum of original section		41.9
Position of rupture		¼ inch from middle of stem
Character of broken surface		silky
Elongation of inch sections		".15, ".35', ".16

No. 549.

Marks, $\frac{12''\ H\ \&\ T}{No.\ 4}$
Length, 5".
Diameter, ".798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000150	.000150	0.	.....	
5,000	10,000	.000300	.000150	0.	.....	
7,500	15,000	.000450	.000150	0.	.....	
10,000	20,000	.000650	.000200	0.	.....	
12,500	25,000	.000800	.000150	0.	.....	
15,000	30,000	.000950	.000150	0.	.....	
17,500	35,000	.001100	.000150	0.	.....	
20,000	40,000	.001300	.000200	.000050	.000050	
22,500	45,000	.001400	.000100	.000050	0.	
25,000	50,000	.001700	.000300	.000100	.000050	
25,500	51,000	.001750	.000050	.....	.....	Elastic limit.
26,000	52,000	.005400	.003650	.....	.....	
26,500	53,000	.006400	.001000	.....	.....	
27,000	54,000	.007450	.001050	.....	.....	
27,500	55,000	.008350	.000900	.006200	.006100	
28,000	56,000	.009000	.000650	.....	.....	
28,500	57,000	.009500	.000500	.....	.....	
29,000	58,000	.010400	.000900	.....	.....	
29,500	59,000	.011000	.000600	.....	.....	
30,000	60,000	.011500	.000500	.009250	.003050	
44,850	89,700	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	51,000
Compression per inch under stress at elastic limit	inch..	0.001750
Ultimate strength per square inch of original section	pounds..	89,700
Manner of failure		triple flexure

No. 550.

Marks, $\frac{12''\ H\ \&\ T}{No.\ 5}$
Length, 5″.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	0.	.....	
5,000	10,000	.000200	.000100	0.	.....	
7,500	15,000	.000350	.000150	0.	.....	
10,000	20,000	.000500	.000150	0.	.....	
12,500	25,000	.000650	.000150	0.	.....	
15,000	30,000	.000850	.000200	0.	.....	
17,500	35,000	.001000	.000150	0.	.....	
20,000	40,000	.001200	.000200	0.	.....	
22,500	45,000	.001350	.000150	0.	.....	
23,000	46,000	.001400	.000050	.....	.....	Elastic limit.
23,500	47,000	.001600	.000200	.....	.....	
24,000	48,000	.004600	.003000	.....	.....	
24,500	49,000	.005600	.001000	.....	.....	
25,000	50,000	.006100	.000500	.004350	.004350	
25,500	51,000	.006700	.000600	.....	.....	
26,000	52,000	.007150	.000450	.....	.....	
26,500	53,000	.007650	.000500	.....	.....	
27,000	54,000	.008300	.000650	.....	.....	
27,500	55,000	.009150	.000850	.007150	.002800	
28,000	56,000	.009800	.000650	.....	.....	
28,500	57,000	.010400	.000600	.....	.....	
29,000	58,000	.011250	.000850	.....	.....	
29,500	59,000	.011850	.000600	.....	.....	
30,000	60,000	.012700	.000850	.010400	.003250	
42,280	84,560	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	46,000
Compression per inch under stress at elastic limit	inch..	0.001400
Ultimate strength per square inch of original section	pounds..	84,560
Manner of failure		triple flexure

No. 551.

Marks, $\frac{12'' \text{ H \& T}}{\text{No. 6}}$
Length, 5″.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	0.	.....	
5,000	10,000	.000250	.000150	0.	.....	
7,500	15,000	.000400	.000150	0.	.....	
10,000	20,000	.000550	.000150	0.	.....	
12,500	25,000	.000750	.000200	0.	.....	
15,000	30,000	.000900	.000150	0.	.....	
17,500	35,000	.001150	.000250	0.	.....	
20,000	40,000	.001200	.000050	.000050	.000050	
22,500	45,000	.001500	.000300	.000100	.000050	
23,000	46,000	.001600	.000100	.....	.....	Elastic limit.
23,500	47,000	.001950	.003350	.....	.....	
24,000	48,000	.006100	.001150	.....	.....	
24,500	49,000	.006300	.000200	.....	.....	
25,000	50,000	.006800	.000500	.005100	.005000	
25,500	51,000	.007250	.000450	.....	.....	
26,000	52,000	.007750	.000500	.....	.....	
26,500	53,000	.008400	.000650	.....	.....	
27,000	54,000	.009000	.000600	.....	.....	
27,500	55,000	.009750	.000750	.007750	.002650	
28,000	56,000	.010250	.000500	.....	.....	
28,500	57,000	.010900	.000650	.....	.....	
29,000	58,000	.011650	.000750	.....	.....	
29,500	59,000	.012450	.000800	.....	.....	
30,000	60,000	.013150	.000700	.011000	.003250	
42,320	84,640	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	46,000
Compression per inch under stress at elastic limit	inch..	0.001600
Ultimate strength per square inch of original section	pounds..	84,640
Manner of failure		triple flexure

No. 552.

Marks, $\frac{12''\ H\ \&\ T}{No.\ 7}$
Length, 3″.22.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000150	.000150	0.	.....	
5,000	10,000	.000300	.000150	0.	.....	
7,500	15,000	.000450	.000150	0.	.....	
10,000	20,000	.000600	.000150	0.	.....	
12,500	25,000	.000750	.000150	0.	.....	
15,000	30,000	.000900	.000150	0.	.....	
17,500	35,000	.001150	.000250	0.	.....	
20,000	40,000	.001200	.000050	0.	.....	
22,500	45,000	.001350	.000150	0.	.....	
23,000	46,000	.001450	.000100	.....	.....	
23,500	47,000	.001450	0.	.....	.....	
24,000	48,000	.001500	.000050	.....	.....	
24,500	49,000	.001500	0.	.....	.....	
25,000	50,000	.001550	.000050	0.	.....	Elastic limit.
25,500	51,000	.006000	.004450	.....	.....	
26,000	52,000	.006950	.000950	.....	.....	
26,500	53,000	.007450	.000500	.....	.....	
27,000	54,000	.008050	.000600	.....	.....	
27,500	55,000	.008750	.000700	.006650	.006650	
28,000	56,000	.009250	.000500	.....	.....	
28,500	57,000	.009850	.000600	.....	.....	
29,000	58,000	.010500	.000650	.....	.....	
29,500	59,000	.011200	.000700	.....	.....	
30,000	60,000	.012000	.000800	.010150	.003500	
65,000	130,000	.....	.....	.....	.....	Total load applied. Caused triple flexure and shortened specimen 1″.22.

No. 553.

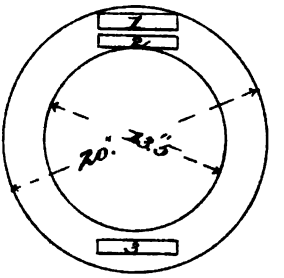
Marks, $\frac{12''\ H\ \&\ T}{No.\ 8}$
Length, 3″.22.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	0.	.....	
5,000	10,000	.0002 0	.000150	0.	.....	
7,500	15,000	.000400	.000150	0.	.....	
10,000	20,000	.000550	.000150	0.	.....	
12,500	25,000	.000700	.000150	0.	.....	
15,000	30,000	.000850	.000150	0.	.....	
17,500	35,000	.001150	.000300	0.	.....	
20,000	40,000	.001250	.000100	0.	.....	
22,500	45,000	.001500	.000250	0.	.....	
23,000	46,000	.001550	.000050	.....	.....	
23,500	47,000	.001600	.000050	.....	.....	
24,000	48,000	.001700	.000100	.....	.....	
24,500	49,000	.001750	.000050	.....	.....	
25,000	50,000	.001850	.000100	.000050	.000050	Elastic limit.
25,500	51,000	.005750	.003900	.....	.....	
26,000	52,000	.006550	.000800	.....	.....	
26,500	53,000	.007300	.000750	.....	.....	
27,000	54,000	.007800	.000500	.....	.....	
27,500	55,000	.008750	.000950	.007000	.006950	
28,000	56,000	.009300	.000550	.....	.....	
28,500	57,000	.009800	.000500	.....	.....	
29,000	58,000	.010700	.000900	.....	.....	
29,500	59,000	.011250	.000550	.....	.....	
30,000	60,000	.012150	.000900	.009700	.002700	
65,000	130,000	.....	.....	.....	.....	Total load applied. Caused triple flexure and shortened specimen 1″.32.

12" Cast Iron B.L. Rifle, hooped and tubed with steel.

Experimental cylinder, Tube section.

Test ring C



H Ex 31/49 2

No. 1680.

Marks, $\frac{C}{T}$
$\frac{}{1}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000267	.000134	0.	.....	
3,750	15,000	.000500	.000233	0.	.....	
5,000	20,000	.000667	.000167	0.	.....	
6,250	25,000	.000800	.000133	0.	.....	
7,500	30,000	.001000	.000200	.000033	.000033	
8,750	35,000	.001133	.000133	.000033	0.	
10,000	40,000	.001400	.000267	.000033	0.	
11,250	45,000	.001567	.000167	.000067	.000034	
11,500	46,000	.001600	.000033	.....	.....	
11,750	47,000	.001633	.000033	.....	.....	
12,000	48,000	.001667	.000034	.....	.....	
12,250	49,000	.001700	.000033	.....	.....	
12,500	50,000	.001767	.000067	.000100	.000033	
12,750	51,000	.001800	.000033	.....	.....	
13,000	52,000	.001833	.000033	.....	.....	
13,250	53,000	.001867	.000034	.....	.....	
13,500	54,000	.001900	.000033	.....	.....	Elastic limit.
13,750	55,000	.009667	.007767	.007300	.007200	
14,000	56,000	.010267	.000600	.....	.....	
14,250	57,000	.010467	.000200	.....	.....	
14,500	58,000	.010967	.000500	.....	.....	
14,750	59,000	.011800	.000833	.....	.....	
15,000	60,000	.012833	.001033	.....	.....	
15,500	62,000	.014433	.001600	.....	.....	
16,000	64,000	.016133	.001700	.....	.....	
16,500	66,000	.018100	.001967	.....	.....	
17,000	68,000	.020133	.002033	.....	.....	
17,500	70,000	.022433	.002300	.....	.....	
18,000	72,000	.024667	.002234	.....	.....	
18,500	74,000	.026867	.002200	.....	.....	
19,000	76,000	.029700	.002833	.....	.....	
19,500	78,000	.032333	.002633	.....	.....	
20,000	80,000	.036333	.004000	.....	.....	
20,500	82,000	.040000	.003667	.....	.....	
21,000	84,000	.044000	.004000	.....	.....	
21,500	86,000	.049000	.005000	.....	.....	
22,000	88,000	.055500	.006500	.....	.....	
22,500	90,000	.063167	.007667	.....	.....	
23,000	92,000	.0733	.010133	.....	.....	
23,500	94,000	.0900	.0167	.....	.....	
23,890	95,560	.1400	.0500	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	95,560
Elastic limit per square inch of original section	do...	54,000
Elongation per inch after rupture	inch..	0.2033
Elongation per inch under strain at elastic limit	do...	.001900
Reduction in diameter at point of rupture	do...	.134
Reduction in area after rupture, per centum of original section		41.9
Position of rupture		½ inch from neck
Character of broken surface		silky; slightly granular
Elongation of inch sections		".32", ".16, ".13

No. 1681.

Marks, $\frac{C}{T}_{2}$

Diameter, ".564.

Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elonga ion per inch.	Perma nent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	.....	
2,500	10,000	.000333	.000166	0.	.....	
3,750	15,000	.000467	.000134	0.	.....	
5,000	20,000	.000633	.000166	0.	.....	
6,250	25,000	.000767	.000134	0.	.....	
7,500	30,000	.000933	.000166	0.	.....	
8,750	35,000	.001100	.000167	0.	.....	
10,000	40,000	.001300	.000200	0.	.....	
11,250	45,000	.001467	.000167	0.	.....	
11,500	46,000	.001500	.000033	.....	.....	
11,750	47,000	.001567	.000067	.....	.....	
12,000	48,000	.001633	.000066	.....	.....	
12,250	49,000	.001667	.000034	.....	.....	Elastic limit.
12,500	50,000	.002233	.004566	.001267	.001267	
12,750	51,000	.002867	.000634	.....	.....	
13,000	52,000	.007367	.000500	.....	.....	
13,250	53,000	.007733	.000366	.....	.....	
13,500	54,000	.008500	.000767	.....	.....	
13,750	55,000	.009200	.000700	.000967	.002700	
14,000	56,000	.010167	.000967	.....	.....	
14,250	57,000	.010633	.000466	.....	.....	
14,500	58,000	.011067	.000434	.....	.....	
14,750	59,000	.012100	.001033	.....	.....	
15,000	60,000	.013233	.001133	.....	.....	
15,500	62,000	.015033	.001800	.....	.....	
16,000	64,000	.016700	.001667	.....	.....	
16,500	66,000	.018667	.001967	.....	.....	
17,000	68,000	.020700	.002033	.....	.....	
17,500	70,000	.023067	.002367	.....	.....	
18,000	72,000	.025700	.002633	.....	.....	
18,500	74,000	.028333	.002633	.....	.....	
19,000	76,000	.031333	.003000	.....	.....	
19,500	78,000	.034733	.003400	.....	.....	
20,000	80,000	.038833	.004100	.....	.....	
20,500	82,000	.043233	.004400	.....	.....	
21,000	84,000	.048500	.005267	.....	.....	
21,600	86,400	.....	.....	.....	.....	Tensile s'rength.

General summary.

Tensi'e strength per square inch of original section	pounds..	86,400
Elastic limit per square inch of original section	do...	49,000
Elongation per inch after rupture	inch..	0.0500
Elongation per inch under strain at elastic limit	do...	.001667
Reduction in diameter at point of rupture	do...	.034
Reduction in area after rupture, per centum of original section		11.8
Position of rupture		".65 from neck
Character of broken surface	granular; with belt of dull-colored metal containing seam	
Elongation of inch sections		".06*, ".04, ".05

No. 1682.

Marks, $\frac{C}{T}_{3}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000267	.000134	0.	.....	
3,750	15,000	.000400	.000133	0.	.....	
5,000	20,000	.000600	.000200	0.	.....	
6,250	25,000	.000733	.000133	0.	.....	
7,500	30,000	.000867	.000134	0.	.....	
8,750	35,000	.001033	.000166	0.	.....	
10,000	40,000	.001267	.000234	0.	.....	
11,250	45,000	.001467	.000200	0.	.....	
11,500	46,000	.001533	.000066	.....	.....	
11,750	47,000	.001600	.000067	.....	.....	Elastic limit.
12,000	48,000	.001733	.000133	.....	.....	
12,250	49,000	.005733	.004000	.....	.....	
12,500	50,000	.006667	.000934	.004767	.004767	
12,750	51,000	.007167	.000500	.....	.....	
13,000	52,000	.007733	.000566	.....	.....	
13,250	53,000	.008167	.000434	.....	.....	
13,500	54,000	.009000	.000833	.....	.....	
13,750	55,000	.010033	.001033	.007733	.002966	
14,000	56,000	.010567	.000534	.....	.....	
14,250	57,000	.010900	.000333	.....	.....	
14,500	58,000	.011733	.000833	.....	.....	
14,750	59,000	.012500	.000767	.....	.....	
15,000	60,000	.013633	.001133	.....	.....	
15,500	62,000	.015367	.001734	.....	.....	
16,000	64,000	.017333	.001966	.....	.....	
16,500	66,000	.019333	.002000	.....	.....	
17,000	68,000	.021467	.002134	.....	.....	
17,500	70,000	.023733	.002266	.....	.....	
18,000	72,000	.026300	.002567	.....	.....	
18,500	74,000	.028833	.002533	.....	.....	
19,000	76,000	.032333	.003500	.....	.....	
19,500	78,000	.035267	.002934	.....	.....	
20,000	80,000	.039333	.004066	.....	.....	
20,500	82,000	.044000	.004667	.....	.....	
21,000	84,000	.049500	.005500	.....	.....	
21,500	86,000	.0567	.0072	.....	.....	
22,000	88,000	.0667	.0100	.....	.....	
22,500	90,000	.0733	.0066	.....	.....	
22,900	92,000	.0933	.0200	.....	.....	
23,500	94,000	.1233	.0300	.....	.....	
23,540	94,160	.1483	.0200	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	94,160
Elastic limit per square inch of original section	do...	47,000
Elongation per inch after rupture	inch..	0.2100
Elongation per inch under strain at elastic limit	do...	.001600
Reduction in diameter at point of rupture	do...	.124
Reduction in area after rupture, per centum of original section		39.2
Position of rupture		½ inch from middle of stem
Character of broken surface		flue granular and silky
Elongation of inch sections		".16, ".33+, ".14

TABULATION OF TENSION SPECIMENS FROM 12-INCH CAST-IRON RIFLE, HOOPED AND TUBED WITH STEEL.

EXPERIMENTAL SECTION.

No. of test.	Position in gun.	Location of specimen.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation.	Contraction of area.	Appearance of fracture.	Specific gravity.	Hardness.	Remarks.
			Pounds.	*Pounds.*	*Pr.ct.*	*Pr.ct.*				
1119	Cast-iron body	Inside		29,000			Granular			
1120	do	do		26,760			do			
1121	do	do		28,720			do			
1122	do	do		28,760			do			
2270	do	do		24,880			Granular; mottled			
2271	do	do		27,450			do			
1013	Steel hoop Ax	Outside	53,000	103,240	13.7	39.2	Granular; silky center			
1014	do	Inside	53,000	105,080	14.7	36.4	do	7.8535	22.39	
1015	do	Middle	53,000	105,280	14.7	36.4	do			
1016	do	do	53,000	104,680	13.3	39.2	Silky			
1017	Steel hoop Bx	Outside	52,000	103,520	14.3	39.2	Silky, with granular metal			
1018	do	Inside	53,000	104,600	15.8	36.4	Granular; dull center	7.8543	22.14	
1019	do	Middle	48,000	102,000	15.5	36.4	Silky; ring of granular metal			
1020	do	do	49,000	100,400	15.7	39.2	Granular; silky center			
1023	Tube	Outside	52,000	96,400	20.3	39.2	Silky			Whitworth steel.
1024	do	Inside	48,000	91,800	10.3	11.8	Granular; defective spot	7.8667	16.31	Do.
1025	do	Middle	48,000	92,800	22.0	41.9	Silky			Do.
1680	do	Outside	54,000	95,560	20.3	41.9	Silky; slightly granular			Do.
1681	do	Inside	49,000	86,400	5.0	11.8	Granular belt of dull-colored metal			Do.
1682	do	Middle	47,000	94,160	21.0	39.2	Fine granular and silky			

TABULATION OF COMPRESSION SPECIMENS FROM 12-INCH CAST-IRON RIFLE, HOOPED AND TUBED WITH STEEL.

EXPERIMENTAL SECTION.

No of test.	Position in gun.	Location of specimen.	Elastic limit per square inch.	Ultimate strength per square inch.	Manner of failure.	Remarks.
			Pounds.	*Pounds.*		
544	Cast-iron body.	Outside.	.....	51,450	Triple flexure.	
545	....do	Middle..	.....	49,900	...do	
546	....do	...do	.....	51,100	.. do	
547	....do	Radial ..	.....	64,300	....do	
548	....do	...do	.....	66,900	....do	
549	Tube..... ..	Outside.	51,000	89,700	...do	Whitworth steel.
550	....do	Inside ..	46,000	81,550	...do	Do.
551	....do	Middle..	46,000	84,640	....do	Do.
552	....do	Radial ..	50,000	Not defined.	.....	130,000 lbs. per square inch caused triple flexure, and shortened specimen 1".22.
553	....do	...do	50,000	...do	.....	130,000 lbs. per square inch caused triple flexure, and shortened specimen 1".32.

12-INCH CAST-IRON B. L. RIFLE,

LINED WITH WIRE-WRAPPED STEEL TUBE.

CAST-IRON SPECIMENS FROM INITIAL TENSION RINGS A, B, AND C FROM SECOND CASTING, AND INITIAL TENSION RING FROM BREECH OF THIRD CASTING.

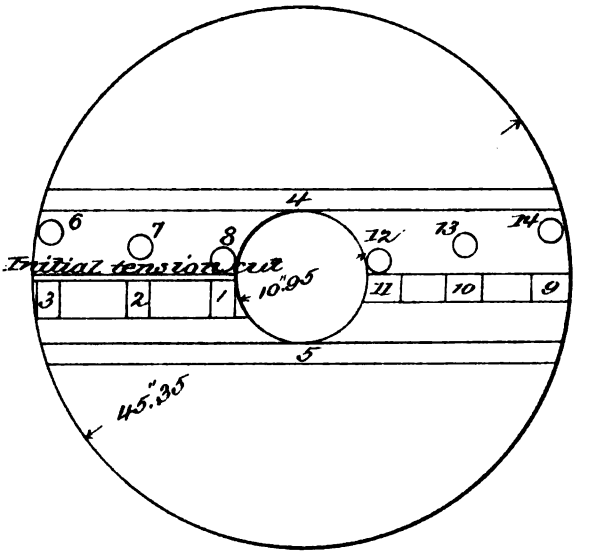
INITIAL TENSION RING A TAKEN 30″ FROM MUZZLE.

INITIAL TENSION RING B TAKEN 0″ FROM MUZZLE.

INITIAL TENSION RING C TAKEN 24″ FROM BREECH OF CASTING AND 4″ IN FRONT OF THE BREECH OF THE FINISHED GUN.

12" Cast Iron B.L. Rifle, lined with wire-wrapped tube.

Initial tension ring A



H Ex 31 49 2

12-INCH CAST-IRON B. L. RIFLE, LINED WITH WIRE-WRAPPED STEEL TUBE.

No. 1725.

Marks, $\frac{12''\ T}{A\ 4}$

Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 30″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000047	.000047	0.	.....	
3,000	3,000	.000100	.000053	.000003	.000003	
4,000	4,000	.000147	.000047	.000007	.000004	
5,000	5,000	.000200	.000053	.000010	.000003	
6,000	6,000	.000250	.000050	.000017	.000007	
7,000	7,000	.000307	.000057	.000020	.000003	
8,000	8,000	.000367	.000060	.000030	.000010	
9,000	9,000	.000420	.000053	.000037	.000007	
10,000	10,000	.000480	.000060	.000043	.000006	
11,000	11,000	.000543	.000063	.000050	.000007	
12,000	12,000	.000603	.000060	.000063	.000013	
13,000	13,000	.000667	.000064	.000077	.000014	
14,000	14,000	.000730	.000063	.000083	.000006	
15,000	15,000	.000810	.000080	.000107	.000024	
16,000	16,000	.000880	.000070	.000123	.000016	
17,000	17,000	.000963	.000083	.000143	.000020	
18,000	18,000	.001047	.000084	.000170	.000027	
19,000	19,000	.001147	.000100	.000207	.000037	
20,000	20,000	.001253	.000106	.000250	.000043	
21,000	21,000	.001390	.000137	.000313	.000063	
22,000	22,000	.001523	.000133	.....	.....	Tensile strength.

Fractured 2¼″ from middle of stem.
Character of broken surface, granular; mottled; resembling granite.
The specimen sustained the maximum load two minutes, then fractured.

No. 1726.

Marks, $\frac{12''\ T}{A\ 5}$

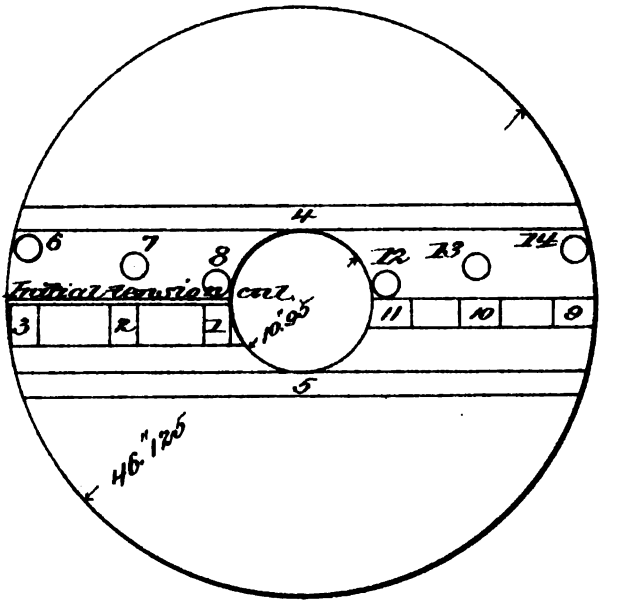
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 30″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000047	.000047	0.	.....	
3,000	3,000	.000100	.000053	0.	.....	
4,000	4,000	.000140	.000040	0.	.....	
5,000	5,000	.000187	.000047	.000003	.000003	
6,000	6,000	.000237	.000050	.000010	.000007	
7,000	7,000	.000290	.000053	.000013	.000003	
8,000	8,000	.000347	.000057	.000017	.000004	
9,000	9,000	.000397	.000050	.000020	.000003	
10,000	10,000	.000453	.000056	.000030	.000010	
11,000	11,000	.000513	.000060	.000037	.000007	
12,000	12,000	.000570	.000057	.000043	.000006	
13,000	13,000	.000637	.000067	.000053	.000010	
14,000	14,000	.000700	.000063	.000067	.000014	
15,000	15,000	.000767	.000067	.000083	.000016	
16,000	16,000	.000847	.000080	.000100	.000017	
17,000	17,000	.000917	.000070	.000117	.000017	
18,000	18,000	.001007	.000090	.000147	.000030	
19,000	19,000	.001097	.000090	.000173	.000026	
20,000	20,000	.001197	.000100	.000203	.000030	
21,000	21,000	.001307	.000110	.000257	.000054	
22,000	22,000	.001430	.000123	.000313	.000056	
25,580	25,580	.....	.....	.....	.....	Tensile strength.

Fractured 4″ from the neck.
Character of broken surface, granular; mottled; resembling granite.

12" Cast Iron B.L. Rifle, lined with wire-wrapped tube.

Initial tension ring B



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No. 1727.

Marks, $\frac{12^{11}\,T}{B\ 4}$

Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 30″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000047	.000047	0.	.....	
3,000	3,000	.000093	.000046	0.	.....	
4,000	4,000	.000140	.000047	0.	.....	
5,000	5,000	.000190	.000050	0.	.....	
6,000	6,000	.000240	.000050	.000007	.000007	
7,000	7,000	.000293	.000053	.000013	.000006	
8,000	8,000	.000347	.000054	.000017	.000004	
9,000	9,000	.000407	.000060	.000020	.000003	
10,000	10,000	.000463	.000056	.000027	.000007	
11,000	11,000	.000523	.000060	.000033	.000006	
12,000	12,000	.000580	.000057	.000043	.000010	
13,000	13,000	.000647	.000067	.000060	.000017	
14,000	14,000	.000720	.000073	.000073	.000013	
15,000	15,000	.000790	.000070	.000090	.000017	
16,000	16,000	.000863	.000073	.000107	.000017	
17,000	17,000	.000947	.000084	.000127	.000020	
18,000	18,000	.001033	.000086	.000150	.000033	
19,000	19,000	.001130	.000097	.000183	.000033	
20,000	20,000	.001240	.000110	.000230	.000047	
21,000	21,000	.001363	.000123	.000290	.000060	
22,000	22,000	.001490	.000127	.000350	.000060	
24,960	24,960	.....	.....	.....	.....	Tensile strength.

Fractured $2\frac{1}{4}$″ from the middle of the stem.
Character of broken surface, granular; mottled; resembling granite.

No. 1728.

Marks, $\frac{12''\ T}{B\ 5}$

Diameter, 1″.129.

Sectional area, 1 square inch.

Length of stem, 30″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000047	.000047	0.	.....	
3,000	3,000	.000099	.000043	0.	.....	
4,000	4,000	.000137	.000047	0.	.....	
5,000	5,000	.000190	.000053	.000063	.000003	
6,000	6,000	.000240	.000050	.000063	0.	
7,000	7,000	.000287	.000047	.000007	.000004	
8,000	8,000	.000347	.000060	.000013	.000006	
9,000	9,000	.000397	.000050	.000020	.000007	
10,000	10,000	.000450	.000053	.000027	.000007	
11,000	11,000	.000510	.000060	.000033	.000006	
12,000	12,000	.000573	.000063	.000043	.000010	
13,000	13,000	.000637	.000064	.000053	.000010	
14,000	14,000	.000703	.000066	.000063	.000010	
15,000	15,000	.000773	.000070	.000080	.000017	
16,000	16,000	.000847	.000074	.000100	.000020	
17,000	17,000	.000933	.000086	.000123	.000023	
18,000	18,000	.001017	.000084	.000150	.000017	
19,000	19,000	.001103	.000086	.000180	.000030	
20,000	20,000	.001217	.000114	.000217	.000037	
21,000	21,000	.001323	.000106	.000267	.000050	
22,000	22,000	.001460	.000137	.000333	.000066	
23,550	23,550	.....	.....	.....	.....	Tensile strength.

Fractured 3″ from the middle of the stem.

Character of broken surface, granular; mottled; resembling granite.

Marks, 12″ T.

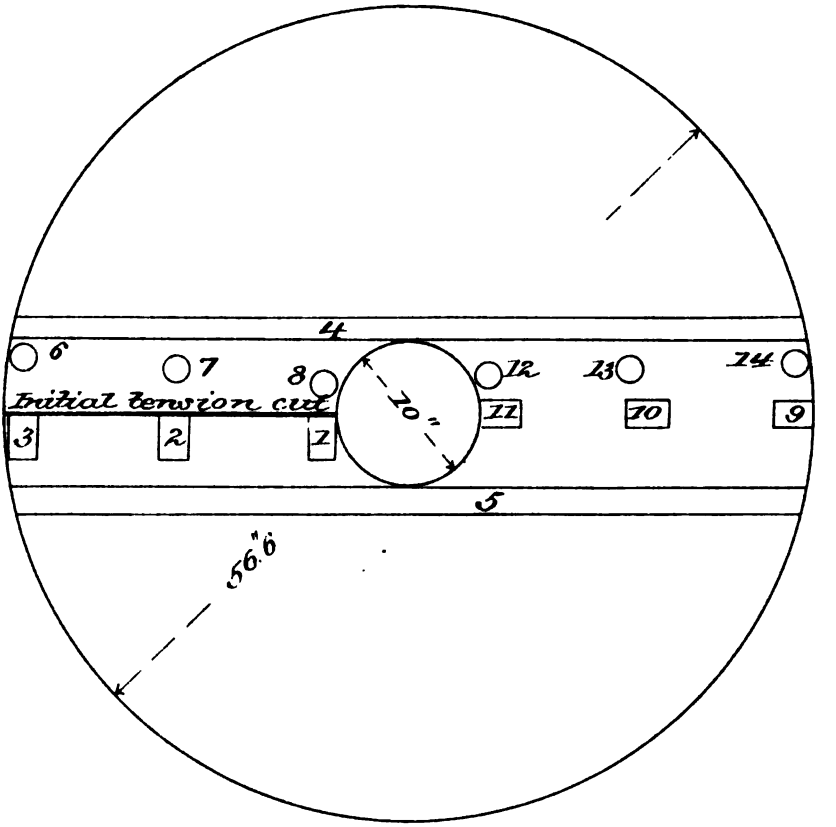
No. of test.	Nos.	Diameter.	Sectional area.	Tensile strength.		
				Total.	Per square inch.	
		Inches.	*Sq. inch.*	*Pounds.*	*Pounds.*	
708	A 1	1.129	1.00	29,820	29,820	Specific gravity, 7.3210; hardness, 17.71.
709	A 2	1.129	1.00	29,410	29,410	
710	A 3	1.129	1.00	33,180	33,180	
1710	A 6	1.129	1.00	34,820	34,820	
1711	A 7	1.129	1.00	28,400	28,400	Specific gravity, 6.6609?
1712	A 8	1.129	1.00	31,350	31,350	Specific gravity, 7.3607
1713	A 9	1.129	1.00	30,620	30,620	
1714	A 10	1.129	1.00	26,150	26,150	
1715	A 11	1.129	1.00	26,940	26,940	
1716	B 1	1.129	1.00	30,280	30,280	Specific gravity, 7.3260
1717	B 2	1.129	1.00	28,900	28,900	Specific gravity, 7.3094
1718	B 3	1.129	1.00	29,850	29,850	
1719	B 6	1.129	1.00	32,680	32,680	
1720	B 7	1.129	1.00	23,620	23,620	
1721	B 8	1.129	1.00	33,700	33,700	
1722	B 9	1.129	1.00	31,080	31,080	
1723	B 10	1.129	1.00	27,700	27,700	
1724	B 11	1.129	1.00	29,700	29,700	

The appearance of fractures of above specimens were granular; mottled; resembling granite.

Marks.	Location of specimen.	Specific gravity.	Hardness.
A 12	Inside	7.2821	17.90
A 13	Middle	7.3122	20.03
A 14	Outside	7.2761	17.53
B 12	Inside	7.3526	19.18
B 13	Middle	7.3012	18.58
B 14	Outside	7.3218	17.53
A	Breech	7.3115	16.90
B	....do	7.2949	16.31
C	At trunnion band	7.3709	20.47
D		7.2091	16.23
E		7.3312	19.18
F	147″ in front of trunnion band.	7.3503	19.81
G		7.3226	18.09
H		7.3423	17.90

72" Cast Iron B. L. Rifle, lined with wire-wrapped tube.

Initial tension ring C



H Ex 31 49 2

No. 2268.

Marks, $\frac{12''\ T}{O\ 4}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Length of stem, 30″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	0.	.....	
3,000	3,000	.000097	.000047	0.	.....	
4,000	4,000	.000143	.000046	.000003	.000003	
5,000	5,000	.000190	.000047	.000007	.000004	
6,000	6,000	.000240	.000050	.000010	.000003	
7,000	7,000	.000297	.000057	.000013	.000003	
8,000	8,000	.000347	.000050	.000020	.000007	
9,000	9,000	.000400	.000053	.000027	.000007	
10,000	10,000	.000457	.000057	.000037	.000010	
11,000	11,000	.000520	.000063	.000043	.000006	
12,000	12,000	.000580	.000060	.000053	.000010	
13,000	13,000	.000640	.000060	.000063	.000010	
14,000	14,000	.000707	.000067	.000073	.000010	
15,000	15,000	.000767	.000060	.000087	.000014	
16,000	16,000	.000837	.000070	.000100	.000013	
17,000	17,000	.000913	.000076	.000120	.000020	
18,000	18,000	.000990	.000077	.000140	.000020	
19,000	19,000	.001067	.000077	.000167	.000027	
20,000	20,000	.001160	.000093	.000197	.000030	
21,000	21,000	.001267	.000107	.000250	.000053	
22,000	22,000	.001390	.000123	.000300	.000050	
22,200	22,200	.....	.....	.....	.....	Tensile strength.

Fractured 11″ from the neck.
Character of broken surface, granular; mottled.

No. 2269.

Marks, $\frac{12''\ T}{C\ 5}$

Diameter, 1″.120.

Sectional area, 1 square inch.

Length of stem, 30″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000047	.000047	0.	.....	
3,000	3,000	.000093	.000046	0.	.....	
4,000	4,000	.000140	.000047	0.	.....	
5,000	5,000	.000193	.000053	.000007	.000007	
6,000	6,000	.000240	.000047	.000013	.000006	
7,000	7,000	.000293	.000053	.000013	0.	
8,000	8,000	.000347	.000054	.000017	.000004	
9,000	9,000	.000400	.000053	.000023	.000006	
10,000	10,000	.000453	.000053	.000033	.000010	
11,000	11,000	.000513	.000060	.000043	.000010	
12,000	12,000	.000577	.000064	.000053	.000010	
13,000	13,000	.000643	.000066	.000067	.000014	
14,000	14,000	.000703	.000060	.000080	.000013	
15,000	15,000	.000770	.000067	.000090	.000010	
16,000	16,000	.000837	.000067	.000100	.000010	
17,000	17,000	.000907	.000070	.000120	.000020	
18,000	18,000	.000987	.000080	.000143	.000023	
19,000	19,000	.001073	.000086	.000167	.000024	
20,000	20,000	.001163	.000090	.000200	.000033	
21,000	21,000	.001260	.000097	.000237	.000037	
22,000	22,000	.001367	.000107	.000283	.000046	
23,700	23,700	.....	.....	.....	.....	Tensile strength.

Fractured 11″ from the neck.

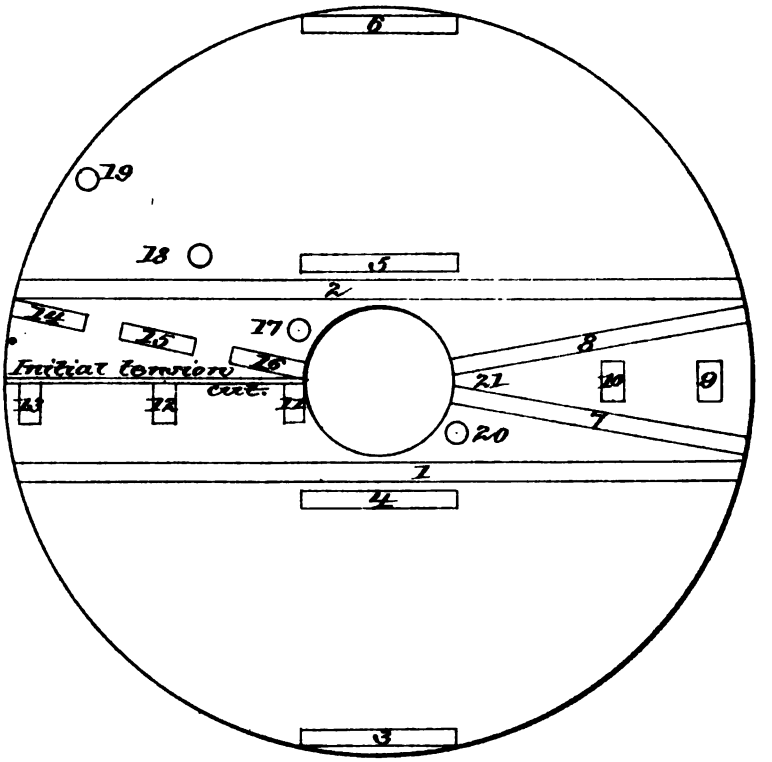
Character of broken surface, granular; mottled.

Marks, 12 T C.

No. of test.	Nos.	Diameter.	Sectional area.	Tensile strength.		Appearance of fracture.
				Total.	Per square inch.	
		Inches.	*Sq. inch.*	*Pounds.*	*Pounds.*	
1728	1	1.129	1.00	30,300	30,300	Granular.
1729	2	1.129	1.00	30,800	30,800	Do.
1730	3	1.129	1.00	32,900	32,900	Do.
1731	6	1.129	1.00	33,600	33,600	Do.
1732	7	1.129	1.00	30,700	30,700	Do.
1733	8	1.129	1.00	28,000	28,000	Do.
1734	9	1.129	1.00	30,100	30,100	Do.
1735	10	1.129	1.00	31,900	31,900	Do.
1736	11	1.129	1.00	34,000	34,000	Do.

12" Cast Iron B. L. Rifle, lined with wire-wrapped tube.

Initial tension ring 3d casting



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No. 2820.

Mark, 1.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 50″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	0.	.....	
3,000	3,000	.000100	.000050	0.	.....	
4,000	4,000	.000152	.000052	.000002	.000002	
5,000	5,000	.000204	.000052	.000008	.000006	
6,000	6,000	.000260	.000056	.000014	.000006	
7,000	7,000	.000314	.000054	.000020	.000006	
8,000	8,000	.000374	.000060	.000026	.000006	
9,000	9,000	.000438	.000064	.000036	.000010	
10,000	10,000	.000502	.000064	.000048	.000012	
11,000	11,000	.000576	.000074	.000064	.000016	
12,000	12,000	.000654	.000078	.000082	.000018	
13,000	13,000	.000732	.000078	.000104	.000022	
14,000	14,000	.000826	.000094	.000134	.000030	
15,000	15,000	.000924	.000098	.000174	.000040	
16,000	16,000	.001040	.000116	.000222	.000048	
17,000	17,000	.001180	.000140	.000296	.000074	
18,000	18,000	.001350	.000170	.000396	.000100	
19,000	19,000	.001560	.000210	.000530	.000134	
19,800	19,800	.....	.....	.....	.....	Tensile strength.

Fractured 8¼″ from middle of stem.
Character of broken surface, granular.

No. 2821.

Mark, 2.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 50″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	0.	.....	
3,000	3,000	.000098	.000048	.000002	.000002	
4,000	4,000	.000152	.000054	.000006	.000004	
5,000	5,000	.000202	.000050	.000008	.000002	
6,000	6,000	.000256	.000054	.000010	.000002	
7,000	7,000	.000314	.000058	.000016	.000006	
8,000	8,000	.000370	.000056	.000026	.000010	
9,000	9,000	.000432	.000062	.000036	.000010	
10,000	10,000	.000500	.000068	.000044	.000008	
11,000	11,000	.000574	.000074	.000058	.000014	
12,000	12,000	.000650	.000076	.000080	.000022	
13,000	13,000	.000730	.000080	.000100	.000020	
14,000	14,000	.000824	.000094	.000136	.000036	
15,000	15,000	.000926	.000102	.000170	.000034	
16,000	16,000	.001046	.000120	.000224	.000054	
17,000	17,000	.001176	.000130	.000290	.000066	
18,000	18,000	.001346	.000170	.000390	.000100	
19,000	19,000	.001544	.000198	.000518	.000128	
19,950	19,950	.....	.....	.....	.....	Tensile strength.

Fractured 1⅜″ from neck.
Character of broken surface, granular.

No. 703.

Mark, 3.
Length, 12″.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050			
3,000	3,000	.000100	.000050			
4,000	4,000	.000150	.000050			
5,000	5,000	.000200	.000050	.000010	.000010	
6,000	6,000	.000240	.000040			
7,000	7,000	.000300	.000060			
8,000	8,000	.000350	.000050			
9,000	9,000	.000400	.000050			
10,000	10,000	.000450	.000050	.000040	.000030	
11,000	11,000	.000500	.000050			
12,000	12,000	.000550	.000050			
13,000	13,000	.000610	.000060			
14,000	14,000	.000670	.000060			
15,000	15,000	.000710	.000040	.000080	.000040	
16,000	16,000	.000760	.000050			
17,000	17,000	.000830	.000070			
18,000	18,000	.000880	.000050			
19,000	19,000	.000940	.000060			
20,000	20,000	.001000	.000060	.000120	.000040	
21,000	21,000	.001090	.000090			
22,000	22,000	.001140	.000050			
23,000	23,000	.001210	.000070			
24,000	24,000	.001300	.000090			
25,000	25,000	.001380	.000080	.000280	.000160	
26,000	26,000	.001500	.000120			
27,000	27,000	.001600	.000100			
28,000	28,000	.001730	.000130			
29,000	29,000	.001920	.000190			
30,000	30,000	.002120	.000200	.000770	.000490	
31,000	31,000	.002390	.000270			
32,000	32,000	.002750	.000360			
33,000	33,000	.003150	.000400			
34,000	34,000	.003600	.000450			
35,000	35,000	.004200	.000600	.002580	.001810	
36,000	36,000	.004790	.000590			
37,000	37,000	.005520	.000730			
38,000	38,000	.006250	.000730			
44,180	44,180					Ultimate strength.

Manner of failure, triple flexure.

No. 704.

Mark, 4.
Length, 12″.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000200	.000050	0.	.....	
6,000	6,000	.000260	.000060	.....	.....	
7,000	7,000	.000310	.000050	.....	.....	
8,000	8,000	.000360	.000050	.....	.....	
9,000	9,000	.000420	.000060	.....	.....	
10,000	10,000	.000480	.000060	.000020	.000020	
11,000	11,000	.000530	.000050	.....	.....	
12,000	12,000	.000590	.000060	.....	.....	
13,000	13,000	.000650	.000060	.....	.....	
14,000	14,000	.000720	.000070	.....	.....	
15,000	15,000	.000780	.000060	.000090	.000070	
16,000	16,000	.000840	.000060	.....	.....	
17,000	17,000	.000900	.000060	.....	.....	
18,000	18,000	.000970	.000070	.....	.....	
19,000	19,000	.001050	.000080	.....	.....	
20,000	20,000	.001130	.000080	.000180	.000090	
21,000	21,000	.001200	.000070	.....	.....	
22,000	22,000	.001290	.000090	.....	.....	
23,000	23,000	.001380	.000090	.....	.....	
24,000	24,000	.001480	.000100	.....	.....	
25,000	25,000	.001570	.000090	.000360	.000180	
26,000	26,000	.001710	.000140	.....	.....	
27,000	27,000	.001840	.000130	.....	.....	
28,000	28,000	.002000	.000160	.....	.....	
29,000	29,000	.002210	.000210	.....	.....	
30,000	30,000	.002440	.000230	.000960	.000620	
31,000	31,000	.002680	.000240	.....	.....	
32,000	32,000	.002970	.000290	.....	.....	
33,000	33,000	.003260	.000290	.....	.....	
34,000	34,000	.003780	.000520	.....	.....	
35,000	35,000	.004220	.000440	.....	.....	
36,000	36,000	.004700	.000480	.....	.....	
37,000	37,000	.005100	.000400	.....	.....	
38,000	38,000	.005620	.000520	.....	.....	
46,300	46,300	.....	.....	.....	.....	Ultimate strength.

Manner of failure, triple flexure.

No. 705.

Mark, 5.
Length, 12″.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000060	.000060	.....	.....	
3,000	3,000	.000110	.000050	.....	.....	
4,000	4,000	.000170	.000060	.....	.....	
5,000	5,000	.000220	.000050	.000010	.000010	
6,000	6,000	.000280	.000060	.....	.....	
7,000	7,000	.000340	.000060	.....	.....	
8,000	8,000	.000400	.000060	.....	.....	
9,000	9,000	.000450	.000050	.....	.....	
10,000	10,000	.000510	.000060	.000040	.000030	
11,000	11,000	.000560	.000050	.....	.....	
12,000	12,000	.000610	.000050	.....	.....	
13,000	13,000	.000680	.000080	.....	.....	
14,000	14,000	.000750	.000070	.....	.....	
15,000	15,000	.000810	.000060	.000100	.000060	
16,000	16,000	.000880	.000070	.....	.....	
17,000	17,000	.000950	.000080	.....	.....	
18,000	18,000	.001040	.000090	.....	.....	
19,000	19,000	.001100	.000060	.....	.....	
20,000	20,000	.001170	.000070	.000190	.000090	
21,000	21,000	.001250	.000080	.....	.....	
22,000	22,000	.001330	.000080	.....	.....	
23,000	23,000	.001420	.000090	.....	.....	
24,000	24,000	.001530	.000110	.....	.....	
25,000	25,000	.001640	.000110	.000400	.000210	
26,000	26,000	.001780	.000140	.....	.....	
27,000	27,000	.001920	.000140	.....	.....	
28,000	28,000	.002080	.000160	.....	.....	
29,000	29,000	.002260	.000180	.....	.....	
30,000	30,000	.002580	.000320	.001050	.000650	
31,000	31,000	.002890	.000310	.....	.....	
32,000	32,000	.003200	.000310	.....	.....	
33,000	33,000	.003500	.000300	.....	.....	
34,000	34,000	.003980	.000480	.....	.....	
35,000	35,000	.004650	.000670	.002810	.001760	
36,000	36,000	.005150	.000500	.....	.....	
37,000	37,000	.005550	.000400	.....	.....	
38,000	38,000	.006550	.001000	.....	.....	
44,250	44,250	.....	.....	.....	.....	Ultimate strength.

Manner of failure, triple flexure.

No. 706.

Mark, 6.
Length, 12″.
Diameter, 1″.129.
Sectional area, 1. square inch.
Gauged length, 10″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000200	.000050	0.	.....	
6,000	6,000	.000250	.000050	.....	.....	
7,000	7,000	.000300	.000050	.....	.....	
8,000	8,000	.000350	.000050	.....	.....	
9,000	9,000	.000400	.000050	.....	.....	
10,000	10,000	.000450	.000050	.000020	.000020	
11,000	11,000	.000500	.000050	.....	.....	
12,000	12,000	.000560	.000060	.....	.....	
13,000	13,000	.000610	.000050	.....	.....	
14,000	14,000	.000670	.000060	.....	.....	
15,000	15,000	.000710	.000040	.000060	.000040	
16,000	16,000	.000780	.000070	.....	.....	
17,000	17,000	.000840	.000060	.....	.....	
18,000	18,000	.000900	.000060	.....	.....	
19,000	19,000	.000950	.000050	.....	.....	
20,000	20,000	.001010	.000060	.000120	.000060	
21,000	21,000	.001080	.000070	.....	.....	
22,000	22,000	.001160	.000080	.....	.....	
23,000	23,000	.001240	.000080	.....	.....	
24,000	24,000	.001320	.000080	.....	.....	
25,000	25,000	.001400	.000080	.000260	.000140	
26,000	26,000	.001490	.000090	.....	.....	
27,000	27,000	.001610	.000120	.....	.....	
28,000	28,000	.001760	.000150	.....	.....	
29,000	29,000	.001920	.000160	.....	.....	
30,000	30,000	.002190	.000270	.000790	.000530	
31,000	31,000	.002480	.000290	.....	.....	
32,000	32,000	.002670	.000190	.....	.....	
33,000	33,000	.003190	.000520	.....	.....	
34,000	34,000	.003540	.000350	.....	.....	
35,000	35,000	.004120	.000580	.....	.....	
36,000	36,000	.004800	.000680	.....	.....	
37,000	37,000	.005200	.000400	.....	.....	
38,000	38,000	.006330	.001130	.....	.....	
45,180	45,180	.....	.....	.....	.....	Ultimate strength.

Manner of failure, triple flexure.

No. 707.

Mark, 7.
Length, 12″.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000060	.000060	.....	.....	
3,000	3,000	.000110	.000050	.....	.....	
4,000	4,000	.000160	.000050	.....	.....	
5,000	5,000	.000200	.000040	.000010	.000010	
6,000	6,000	.000250	.000050	.....	.....	
7,000	7,000	.000300	.000050	.....	.....	
8,000	8,000	.000350	.000050	.....	.....	
9,000	9,000	.000400	.000050	.....	.....	
10,000	10,000	.000460	.000060	.000020	.000010	
11,000	11,000	.000520	.000060	.....	.....	
12,000	12,000	.000580	.000060	.....	.....	
13,000	13,000	.000630	.000050	.....	.....	
14,000	14,000	.000700	.000070	.....	.....	
15,000	15,000	.000750	.000050	.000080	.000060	
16,000	16,000	.000810	.000060	.....	.....	
17,000	17,000	.000860	.000050	.....	.....	
18,000	18,000	.000920	.000060	.....	.....	
19,000	19,000	.000990	.000070	.....	.....	
20,000	20,000	.001070	.000080	.000150	.000070	
21,000	21,000	.001150	.000080	.....	.....	
22,000	22,000	.001210	.000060	.....	.....	
23,000	23,000	.001300	.000090	.....	.....	
24,000	24,000	.001390	.000090	.....	.....	
25,000	25,000	.001500	.000110	.000330	.000180	
26,000	26,000	.001630	.000130	.....	.....	
27,000	27,000	.001760	.000130	.....	.....	
28,000	28,000	.001900	.000140	.....	.....	
29,000	29,000	.002150	.000250	.....	.....	
30,000	30,000	.002340	.000190	.000530	.000600	
31,000	31,000	.002640	.000300	.....	.....	
32,000	32,000	.002900	.000260	.....	.....	
33,000	33,000	.003300	.000400	.....	.....	
34,000	34,000	.003800	.000500	.....	.....	
35,000	35,000	.004400	.000600	.002690	.001760	
36,000	36,000	.004990	.000590	.....	.....	
37,000	37,000	.005400	.000410	.....	.....	
38,000	38,000	.006250	.000850	.....	.....	
46,820	46,820	.....	.....	.....	.....	Ultimate strength.

Manner of failure, triple flexure.

No. 708.

Mark, 8.
Length, 12″.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	0.	0.	Initial load.
2,000	2,000	.000050	.000050	.....	.....	
3,000	3,000	.000100	.000050	.....	.....	
4,000	4,000	.000150	.000050	.....	.....	
5,000	5,000	.000200	.000050	0.	.....	
6,000	6,000	.000250	.000050	.....	.....	
7,000	7,000	.000300	.000050	.....	.....	
8,000	8,000	.000350	.000050	.....	.....	
9,000	9,000	.000410	.000060	.....	.....	
10,000	10,000	.000470	.000060	.000020	.000020	
11,000	11,000	.000540	.000070	.....	.....	
12,000	12,000	.000590	.000050	.....	.....	
13,000	13,000	.000650	.000060	.....	.....	
14,000	14,000	.000700	.000050	.....	.....	
15,000	15,000	.000770	.000070	.000090	.000070	
16,000	16,000	.000830	.000060	.....	.....	
17,000	17,000	.000900	.000070	.....	.....	
18,000	18,000	.000970	.000070	.....	.....	
19,000	19,000	.001040	.000070	.....	.....	
20,000	20,000	.001110	.000070	.000170	.000080	
21,000	21,000	.001200	.000090	.....	.....	
22,000	22,000	.001280	.000080	.....	.....	
23,000	23,000	.001380	.000100	.....	.....	
24,000	24,000	.001480	.000100	.....	.....	
25,000	25,000	.001580	.000100	.000390	.000220	
26,000	26,000	.001730	.000150	.....	.....	
27,000	27,000	.001890	.000160	.....	.....	
28,000	28,000	.002070	.000180	.....	.....	
29,000	29,000	.002230	.000160	.....	.....	
30,000	30,000	.002500	.000270	.001050	.000660	
31,000	31,000	.002880	.000380	.....	.....	
32,000	32,000	.003140	.000260	.....	.....	
33,000	33,000	.003500	.000360	.....	.....	
34,000	34,000	.003900	.000400	.....	.....	
35,000	35,000	.004520	.000620	.002800	.001750	
36,000	36,000	.005050	.000530	.....	.....	
37,000	37,000	.005500	.000450	.....	.....	
38,000	38,000	.006300	.000800	.....	.....	
45,680	45,680	.....	.....	.....	.....	Ultimate strength.

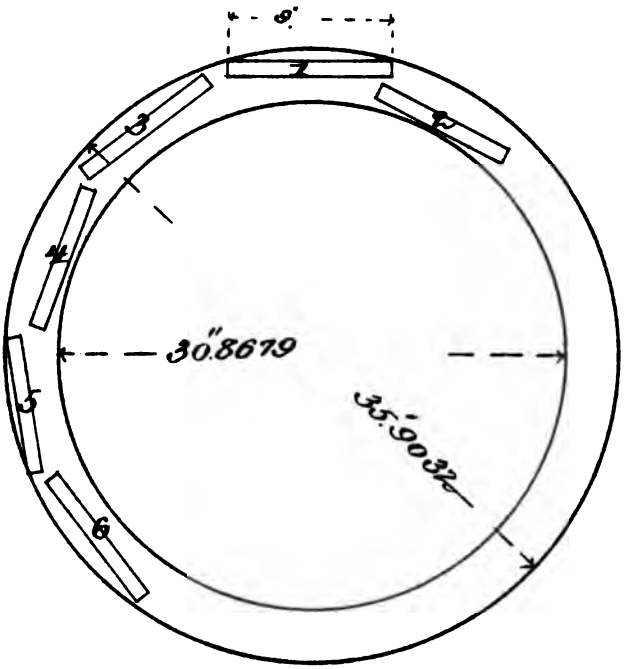
Manner of failure, triple flexure.

Marks, $\frac{12\,C\,I\,R;\,T\,R}{B\,T,\ \&c.}$

No. of test.	Nos.	Diameter.	Sectional area.	Tensile strength.		Appearance of fracture.
				Total.	Per square inch.	
		Inches.	*Sq. inch.*	*Pounds.*	*Pounds.*	
795	9 O	1.129	1.00	30,050	30,050	Granular.
796	10 M	1.129	1.00	29,280	29,280	Do.
797	14 O	1.129	1.00	26,720	26,720	Do.
.....	14..	1.129	1.00	28,210	28,210	Do.
798	15 M	1.129	1.00	28,450	28,450	Do.
799	16 I	1.129	1.00	30,180	30,180	Do.
800	17 I	1.129	1.00	33,560	33,560	Do.
801	18 M	1.129	1.00	28,820	28,820	Do.
802	19 O	1.129	1.00	30,290	30,290	Do.
803	20 I	1.129	1.00	31,650	31,650	Do.
804	21 I	1.129	1.00	30,780	30,780	Do.

12" Cast Iron M.L. Rifled Mortar

Hoop Ax



H Ex 31 49 2

12-INCH CAST-IRON M. L. RIFLED MORTAR,

EXPERIMENTAL CYLINDER.

STEEL SPECIMENS FROM HOOP Ax AFTER UNHOOPING.
SPECIMEN No. 3 WAS TAKEN OUT AT THE POINT WHERE THE MOLTEN CAST-IRON USED IN UNHOOPING ADHERED TO THE HOOP IN COOLING.

12-INCH CAST-IRON M. L. RIFLED MORTAR.

No. 1123.

Marks, $\frac{12''\ M}{A\ No.\ 1}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000300	.000167	0.	.....	
3,750	15,000	.000467	.000167	0.	.....	
5,000	20,000	.000617	.000150	0.	.....	
6,250	25,000	.000750	.000133	0.	.....	
7,500	30,000	.000933	.000183	.000017	.000017	
8,750	35,000	.001083	.000150	.000017	0.	
10,000	40,000	.001250	.000167	.000017	0.	
11,250	45,000	.001383	.000133	.000017	0.	
11,500	46,000	.001417	.000034	.....	.....	
11,750	47,000	.001450	.000033	.....	.....	
12,000	48,000	.001500	.000050	.....	.....	
12,250	49,000	.001567	.000067	.....	.....	
12,500	50,000	.001600	.000033	.000033	.000016	
12,750	51,000	.001633	.000033	.....	.....	
13,000	52,000	.001650	.000017	.....	.....	
13,500	54,000	.001683	.000033	.....	.....	Elastic limit.
13,750	55,000	.001800	.000117	.000100	.000067	
14,000	56,000	.002133	.000333	.....	.....	
14,250	57,000	.002350	.000217	.....	.....	
14,500	58,000	.002733	.000383	.....	.....	
14,750	59,000	.003067	.000334	.....	.....	
15,000	60,000	.003567	.000500	.001567	.001467	
15,500	62,000	.004667	.001100	.....	.....	
16,000	64,000	.005900	.001233	.....	.....	
16,500	66,000	.007183	.001283	.....	.....	
17,000	68,000	.008683	.001500	.....	.....	
17,500	70,000	.010200	.001517	.....	.....	
18,000	72,000	.011683	.001483	.....	.....	
18,500	74,000	.013083	.001400	.....	.....	
19,000	76,000	.014667	.001584	.....	.....	
19,500	78,000	.016167	.001500	.....	.....	
20,000	80,000	.017833	.001666	.....	.....	
20,500	82,000	.019683	.001850	.....	.....	
21,000	84,000	.021667	.001984	.....	.....	
21,500	86,000	.023667	.002000	.....	.....	
22,000	88,000	.025833	.002166	.....	.....	
22,500	90,000	.028000	.002167	.....	.....	
23,000	92,000	.030917	.002917	.....	.....	
23,500	94,000	.033333	.002416	.....	.....	
24,000	96,000	.0367	.003367	.....	.....	
24,500	98,000	.0400	.0033	.....	.....	
25,000	100,000	.0450	.0050	.....	.....	
25,500	102,000	.0517	.0067	.....	.....	
26,000	104,000	.0583	.0066	.....	.....	
26,500	106,000	.0667	.0084	.....	.....	
27,000	108,000	.0867	.0200	.....	.....	
27,120	108,480	.1063	.0216	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	108,480
Elastic limit per square inch of original section	do...	54,000
Elongation per inch after rupture	inch..	0.1467
Elongation per inch under strain at elastic limit	do...	.001683
Reduction in diameter at point of rupture	do...	.084
Reduction in area after rupture, per centum of original section		27.6
Position of rupture		".90 from middle of stem
Character of broken surface	granular; dull spot at circumference	
Elongation of inch sections		".09, ".17, ".27", ".14, ".12, ".09

No. 1124.

Marks, $\frac{12''\ M}{A}$ No. 2
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	.....	
2,500	10,000	.000317	.000167	0.	.....	
3,750	15,000	.000483	.000166	0.	.....	
5,000	20,000	.000650	.000167	0.	.....	
6,250	25,000	.000817	.000167	0.	.....	
7,500	30,000	.001000	.000183	0.	.....	
8,750	35,000	.001150	.000150	.000017	.000017	
10,000	40,000	.001317	.000167	.000017	0.	
11,250	45,000	.001467	.000150	.000017	0.	
12,500	50,000	.001633	.000166	.000033	.000016	
12,750	51,000	.001667	.000134	.....	.....	
13,000	52,000	.001700	.000033	.....	.....	
13,250	53,000	.001733	.000033	.....	.....	
13,500	54,000	.001750	.000017	.....	.....	
13,750	55,000	.001783	.000033	.000033	0.	
14,000	56,000	.001867	.000084	.....	.....	
14,250	57,000	.001917	.000050	.....	.....	
14,500	58,000	.001967	.000050	.....	.....	
14,750	59,000	.002033	.000066	.....	.....	
15,000	60,000	.002067	.000034	.000133	.000100	Elastic limit.
15,250	61,000	.002133	.000066	.....	.....	
15,500	62,000	.002283	.000150	.....	.....	
15,750	63,000	.002500	.000217	.....	.....	
16,000	64,000	.002717	.000217	.....	.....	
16,250	65,000	.002950	.000233	.....	.....	
16,500	66,000	.003533	.000583	.....	.....	
16,750	67,000	.004333	.000800	.....	.....	
17,000	68,000	.004667	.000334	.....	.....	
17,250	69,000	.005333	.000666	.....	.....	
17,500	70,000	.006017	.000684	.....	.....	
18,000	72,000	.007500	.001483	.....	.....	
18,500	74,000	.009050	.001550	.....	.....	
19,000	76,000	.010750	.001700	.....	.....	
19,500	78,000	.012000	.001250	.....	.....	
20,000	80,000	.013583	.001583	.....	.....	
20,500	82,000	.015200	.001617	.....	.....	
21,000	84,000	.017083	.001883	.....	.....	
21,500	86,000	.018750	.001667	.....	.....	
22,000	88,000	.020683	.001933	.....	.....	
22,500	90,000	.022750	.002067	.....	.....	
23,000	92,000	.024667	.001917	.....	.....	
23,500	94,000	.027250	.002583	.....	.....	
24,000	96,000	.029600	.002350	.....	.....	
24,500	98,000	.032500	.002900	.....	.....	
25,000	100,000	.035667	.003167	.....	.....	
25,500	102,000	.039833	.004166	.....	.....	
26,000	104,000	.043533	.003700	.....	.....	
26,500	106,000	.0483	.004767	.....	.....	
27,000	108,000	.0550	.0067	.....	.....	
27,500	110,000	.0650	.0100	.....	.....	
28,000	112,000	.0833	.0183	.....	.....	
28,110	112,440	.0983	.0150	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	112,440
Elastic limit per square inch of original section	do...	60,000
Elongation per inch after rupture	inch..	0.1083
Elongation per inch under strain at elastic limit	do...	.002067
Reduction in diameter at point of rupture	do...	.074
Reduction in area after rupture, per centum of original section		24.6
Position of rupture		".70 from neck
Character of broken surface		granular; small dull spot at the circumference
Elongation of inch sections		".20", ".11, ".10, ".08, ".09, ".07

No. 1125.

Marks, $\frac{12''\ M}{A}$ No. 3

Diameter, ".564.

Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000233	.000166	0.	.....	
3,750	15,000	.000450	.000167	0.	.....	
5,000	20,000	.000600	.000150	0.	.....	
6,250	25,000	.000783	.000183	0.	.....	
7,500	30,000	.000933	.000150	0.	.....	
8,750	35,000	.001100	.000167	0.	.....	
10,000	40,000	.001267	.000167	.000017	.000017	
11,250	45,000	.001433	.000166	.000033	.000016	
12,500	50,000	.001617	.000184	.000033	0.	
12,750	51,000	.001667	.000050	.....	.....	
13,000	52,000	.001700	.000033	.....	.....	Elastic limit.
13,250	53,000	.001733	.000033	.....	.....	
13,500	54,000	.001817	.000084	.....	.....	
13,750	55,000	.001967	.000100	.000133	.000150	
14,000	56,000	.002367	.000400	.....	.....	
14,250	57,000	.002633	.000266	.....	.....	
14,500	58,000	.002967	.000334	.....	.....	
14,750	59,000	.003300	.000333	.....	.....	
15,000	60,000	.003917	.000617	.001867	.001684	
15,500	62,000	.004900	.000983	.....	.....	
16,000	64,000	.006167	.001267	.....	.....	
16,500	66,000	.007583	.001416	.....	.....	
17,000	68,000	.009283	.001700	.....	.....	
17,500	70,000	.010517	.001734	.....	.....	
18,000	72,000	.011800	.001283	.....	.....	
18,500	74,000	.013183	.001383	.....	.....	
19,000	76,000	.014867	.001684	.....	.....	
19,500	78,000	.016417	.001550	.....	.....	
20,000	80,000	.018500	.002083	.....	.....	
20,500	82,000	.020250	.001750	.....	.....	
21,000	84,000	.022167	.001917	.....	.....	
21,500	86,000	.023917	.001750	.....	.....	
22,000	88,000	.026017	.002100	.....	.....	
22,500	90,000	.028417	.002400	.....	.....	
23,000	92,000	.030900	.002483	.....	.....	
23,500	94,000	.033667	.002767	.....	.....	
24,000	96,000	.037000	.003333	.....	.....	
24,500	98,000	.040583	.003583	.....	.....	
25,000	100,000	.044833	.004250	.....	.....	
25,500	102,000	.050667	.005834	.....	.....	
26,000	104,000	.0550	.004333	.....	.....	
26,500	106,000	.0560	.0100	.....	.....	
27,000	108,000	.0667	.0217	.....	.....	
27,180	108,720	.1083	.0166	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	108,720
Elastic limit per square inch of original section	do...	52,000
Elongation per inch after rupture	inch..	0.1450
Elongation per inch under strain at elastic limit	do...	.001700
Reduction in diameter at point of rupture	do...	.084
Reduction in area after rupture, per centum of original section		27.6
Position of rupture		½ inch from middle of stem
Character of broken surface		granular; dull spot near circumference
Elongation of inch sections		".10, ".11, ".27, ".16, ".12, ".11

No. 1126.

Marks, $\frac{12''\ M}{A}$ No. 4
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000300	.000183	0.	.....	
3,750	15,000	.000433	.000133	0.	.....	
5,000	20,000	.000600	.000167	0.	.....	
6,250	25,000	.000783	.000183	0.	.....	
7,500	30,000	.000950	.000167	0.	.....	
8,750	35,000	.001100	.000150	0.	.....	
10,000	40,000	.001250	.000150	0.	.....	
11,250	45,000	.001433	.000183	0.	.....	
12,500	50,000	.001600	.000167	0.	.....	
12,750	51,000	.001617	.000017	.....	.....	
13,000	52,000	.001650	.000033	.....	.....	
13,250	53,000	.001683	.000033	.....	.....	
13,500	54,000	.001717	.000034	.....	.....	
13,750	55,000	.001750	.000033	0.	.....	
14,000	56,000	.001800	.000050	.....	.....	
14,250	57,000	.001867	.000067	.....	.....	
14,500	58,000	.001900	.000033	.....	.....	Elastic limit.
14,750	59,000	.001967	.000067	.....	.....	
15,000	60,000	.002117	.000150	.000200	.000200	
15,500	62,000	.002383	.000266	.....	.....	
16,000	64,000	.002800	.000417	.....	.....	
16,500	66,000	.003733	.000933	.....	.....	
17,000	68,000	.005067	.001334	.....	.....	
17,500	70,000	.006500	.001433	.....	.....	
18,000	72,000	.007917	.001417	.....	.....	
18,500	74,000	.009583	.001666	.....	.....	
19,000	76,000	.011200	.001617	.....	.....	
19,500	78,000	.012900	.001700	.....	.....	
20,000	80,000	.014233	.001333	.....	.....	
20,500	82,000	.016000	.001767	.....	.....	
21,000	84,000	.017750	.001750	.....	.....	
21,500	86,000	.019500	.001750	.....	.....	
22,000	88,000	.021667	.002167	.....	.....	
22,500	90,000	.023533	.001866	.....	.....	
23,000	92,000	.025833	.002300	.....	.....	
23,500	94,000	.028417	.002584	.....	.....	
24,000	96,000	.030833	.002416	.....	.....	
24,500	98,000	.033750	.002917	.....	.....	
25,000	100,000	.037333	.003583	.....	.....	
25,500	102,000	.041167	.003834	.....	.....	
26,000	104,000	.045250	.004083	.....	.....	
26,500	106,000	.051083	.005833	.....	.....	
27,000	108,000	.0600	.008917	.....	.....	
27,500	110,000	.0717	.0117	.....	.....	
27,820	111,280	.0983	.0266	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	111,280
Elastic limit per square inch of original section	do...	58,000
Elongation per inch after rupture	inch..	0.1083
Elongation per inch under strain at elastic limit	do...	.001900
Reduction in diameter at point of rupture	do...	.074
Reduction in area after rupture, per centum of original section		24.6
Position of rupture		".80 from neck
Character of broken surface		granular; dull spot near circumference
Elongation of inch sections		".21*, ".12, ".08, ".08, ".08, ".08

No. 1127.

Marks, $\frac{12''\ M}{A}$ No. 5
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000117	.000117	0.	.....	
2,500	10,000	.000300	.000183	0.	.....	
3,750	15,000	.000433	.000133	0.	.....	
5,000	20,000	.000600	.000167	0.	.....	
6,250	25,000	.000767	.000167	0.	.....	
7,500	30,000	.000917	.000150	0.	.....	
8,750	35,000	.001083	.000166	0.	.....	
10,000	40,000	.001250	.000167	0.	.....	
11,250	45,000	.001400	.000150	0.	.....	
12,500	50,000	.001583	.000183	.000017	.000017	
12,750	51,000	.001600	.000017	.....	.....	
13,000	52,000	.001633	.000033	.....	.....	
13,250	53,000	.001683	.000050	.....	.....	
13,500	54,000	.001733	.000050	.....	.....	
13,750	55,000	.001800	.000067	.000050	.000033	Elastic limit.
14,000	56,000	.002033	.000233	.....	.....	
14,250	57,000	.002367	.000334	.....	.....	
14,500	58,000	.002717	.000350	.....	.....	
14,750	59,000	.003083	.000366	.....	.....	
15,000	60,000	.003700	.000617	.001633	.001583	
15,500	62,000	.004850	.001150	.....	.....	
16,000	64,000	.006167	.001317	.....	.....	
16,500	66,000	.007667	.001500	.....	.....	
17,000	68,000	.009100	.001433	.....	.....	
17,500	70,000	.010700	.001800	.....	.....	
18,000	72,000	.012167	.001467	.....	.....	
18,500	74,000	.013750	.001583	.....	.....	
19,000	76,000	.015583	.001833	.....	.....	
19,500	78,000	.017500	.001917	.....	.....	
20,000	80,000	.019333	.001833	.....	.....	
20,500	82,000	.021033	.001700	.....	.....	
21,000	84,000	.022833	.001800	.....	.....	
21,500	86,000	.024917	.002084	.....	.....	
22,000	88,000	.027033	.002116	.....	.....	
22,500	90,000	.029550	.002517	.....	.....	
23,000	92,000	.032667	.003117	.....	.....	
23,500	94,000	.035833	.003166	.....	.....	
24,000	96,000	.039083	.003250	.....	.....	
24,500	98,000	.043667	.004584	.....	.....	
25,000	100,000	.049000	.005333	.....	.....	
25,500	102,000	.0550	.0060	.....	.....	
26,000	104,000	.0650	.0100	.....	.....	
26,500	106,000	.0817	.0167	.....	.....	
26,700	106,800	.1150	.0333	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	106,800
Elastic limit per square inch of original section	do...	55,000
Elongation per inch after rupture	inch..	0.1383
Elongation per inch under strain at elastic limit	do...	.001800
Reduction in diameter at point of rupture	do...	.094
Reduction in area after rupture, per centum of original section		30.6
Position of rupture		1 inch from neck
Character of broken surface		granular; dull center
Elongation of inch sections		".22*, ".16, ".12, ".11, ".12, ".10

No. 1128.

Marks, $\frac{12''\ M}{A}$ No. 6
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	.....	
2,500	10,000	.000333	.000183	0.	.....	
3,750	15,000	.000467	.000134	0.	.....	
5,000	20,000	.000617	.000150	0.	.....	
6,250	25,000	.000767	.000150	0.	.....	
7,500	30,000	.000950	.000183	.000017	.000017	
8,750	35,000	.001117	.000167	.000017	0.	
10,000	40,000	.001283	.000166	.000017	0.	
11,250	45,000	.001450	.000167	.000017	0.	
12,500	50,000	.001617	.000167	.000033	.000016	
12,750	51,000	.001650	.000033	.....	.....	
13,000	52,000	.001683	.000033	.....	.....	
13,250	53,000	.001733	.000050	.....	.....	
13,500	54,000	.001783	.000050	.....	.....	Elastic limit.
13,750	55,000	.001867	.000084	.000100	.000067	
14,000	56,000	.001983	.000116	.....	.....	
14,250	57,000	.002133	.000150	.....	.....	
14,500	58,000	.002267	.000134	.....	.....	
14,750	59,000	.002483	.000216	.....	.....	
15,000	60,000	.002983	.000500	.000950	.000850	
15,500	62,000	.003933	.000950	.....	.....	
16,000	64,000	.005283	.001350	.....	.....	
16,500	66,000	.006750	.001467	.....	.....	
17,000	68,000	.008250	.001500	.....	.....	
17,500	70,000	.009600	.001350	.....	.....	
18,000	72,000	.011167	.001567	.....	.....	
18,500	74,000	.012667	.001500	.....	.....	
19,000	76,000	.014333	.001666	.....	.....	
19,500	78,000	.016250	.001917	.....	.....	
20,000	80,000	.018000	.001750	.....	.....	
20,500	82,000	.019500	.001509	.....	.....	
21,000	84,000	.021333	.001833	.....	.....	
21,500	86,000	.023667	.002334	.....	.....	
22,000	88,000	.025667	.002000	.....	.....	
23,500	90,000	.028200	.002533	.....	.....	
23,000	92,000	.030833	.002633	.....	.....	
23,500	94,000	.033683	.002850	.....	.....	
24,000	96,000	.037167	.003484	.....	.....	
24,500	98,000	.040833	.003666	.....	.....	
25,000	100,000	.045667	.004834	.....	.....	
25,500	102,000	.051250	.005583	.....	.....	
26,000	104,000	.058750	.007500	.....	.....	
26,500	106,000	.0733	.014550	.....	.....	
26,900	107,600	.1017	.0284	.....	.....	Tensile strength.

General summary.

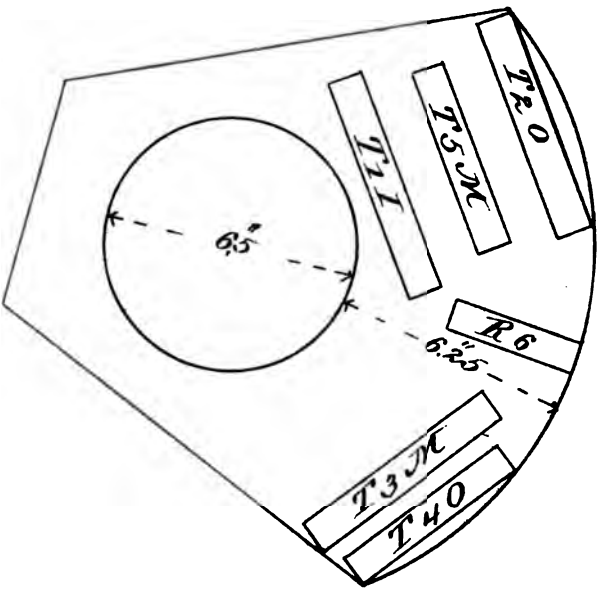
Tensile strength per square inch of original section	pounds..	107,600
Elastic limit per square inch of original section	do...	54,000
Elongation per inch after rupture	inch..	0.1200
Elongation per inch under strain at elastic limit	do...	.001783
Reduction in diameter at point of rupture	do...	.084
Reduction in area after rupture, per centum of original section		27.6
Position of ruptnre		".85 from neck
Character of broken surface		granular; dull center
Elongation of inch sections		".23*, ".12, ".10, ".09, ".09, ".09

FRICTIONAL RESISTANCE EXPERIMENTS.

TESTS OF SPECIMENS TAKEN FROM TUBE SECTION.

Frictional Resistance Exp.

Slice from end of tube cylinder.



H Ex 31 492

Axes of outside and middle specimens about 2 inches from end of forging; axis of inside specimen about three-fourths of an inch from end of forging.

No. 2209.

Marks, $\frac{8\,T\,Cex}{T,\,I}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	.....	
2,500	10,000	.000233	.000166	0.	.....	
3,750	15,000	.000467	.000234	0.	.....	
5,000	20,000	.000633	.000166	0.	.....	
6,250	25,000	.000800	.000167	0.	.....	
7,500	30,000	.000967	.000167	0.	.....	
8,750	35,000	.001100	.000133	0.	.....	
10,000	40,000	.001300	.000200	0.	.....	
10,250	41,000	.001300	0.	.....	.....	
10,500	42,000	.001367	.000067	.....	.....	
10,750	43,000	.001433	.000066	.....	.....	
11,000	44,000	.001467	.000034	.....	.....	
11,250	45,000	.001467	0.	0.	.....	
11,500	46,000	.001500	.000033	.....	.....	
11,750	47,000	.001600	.000100	.....	.....	
12,000	48,000	.001700	.000100	.....	.....	
12,250	49,000	.001767	.000067	.....	.....	Elastic limit.
12,500	50,000	.001967	.000200	.000300	.000300	
12,750	51,000	.002267	.000300	.....	.....	
13,000	52,000	.003567	.001300	.....	.....	
13,250	53,000	.004567	.001000	.....	.....	
13,500	54,000	.005833	.001266	.....	.....	
13,750	55,000	.006833	.001000	.....	.....	
14,000	56,000	.008133	.001300	.....	.....	
14,250	57,000	.009133	.001000	.....	.....	
14,500	58,000	.010133	.001000	.....	.....	
14,750	59,000	.011100	.000967	.....	.....	
15,000	60,000	.012333	.001233	.....	.....	
15,500	62,000	.014133	.001800	.....	.....	
16,000	64,000	.016600	.002467	.....	.....	
16,500	66,000	.018667	.002067	.....	.....	
17,000	68,000	.021167	.002500	.....	.....	
17,500	70,000	.024000	.002833	.....	.....	
18,000	72,000	.026700	.002700	.....	.....	
18,500	74,000	.030033	.003333	.....	.....	
19,000	76,000	.034000	.003967	.....	.....	
19,500	78,000	.038467	.004467	.....	.....	
20,000	80,000	.044000	.005533	.....	.....	
20,500	82,000	.050333	.006333	.....	.....	
21,000	84,000	.0600	.009667	.....	.....	
21,500	86,000	.0767	.0167	.....	.....	
22,000	88,000	.0967	.0200	.....	.....	
22,270	89,080	.1400	.0433	.....	.....	Tensile strength.

General summary.

Specific gravity	7.8556
Hardness	17.17
Tensile strength per square inch of original section ..... pounds	89,080
Elastic limit per square inch of original section ..... do	49,000
Elongation per inch after rupture ..... inch	0.2333
Elongation per inch under strain at elastic limit ..... do	.001767
Reduction in diameter at point of rupture ..... do	.154
Reduction in area after rupture, per centum of original section	47.2
Position of rupture	1″.3 from neck
Character of broken surface	silky; traces of granulation
Elongation of inch sections	″.12, ″.37*, ″.21

No. 2210.

Marks, $\frac{8\,T\,Cex}{T_2\,O}$
Diameter, ″.565.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	.....	
2,500	10,000	.000367	.000200	0.	.....	
3,750	15,000	.000500	.000133	0.	.....	
5,000	20,000	.000667	.000167	0.	.....	
6,250	25,000	.000833	.000166	0.	.....	
7,500	30,000	.001000	.000167	0.	.....	
8,750	35,000	.001176	.000167	0.	.....	
10,000	40,000	.001333	.000166	0.	.....	
10,250	41,000	.001376	.000034	.....	.....	
10,500	42,000	.001400	.000033	.....	.....	
10,750	43,000	.001400	0.	.....	.....	
11,000	44,000	.001467	.000067	.....	.....	
11,250	45,000	.001500	.000033	0.	.....	
11,500	46,000	.001533	.000033	.....	.....	
11,750	47,000	.001567	.000034	.....	.....	
12,000	48,000	.001600	.000033	.....	.....	Elastic limit.
12,250	49,000	.001700	.000100	.....	.....	
12,500	50,000	.002033	.000333	.000400	.000400	
12,750	51,000	.002500	.000467	.....	.....	
13,000	52,000	.003733	.001233	.....	.....	
13,250	53,000	.004833	.001100	.....	.....	
13,500	54,000	.006000	.001167	.....	.....	
13,750	55,000	.007067	.001067	.....	.....	
14,000	56,000	.008333	.001266	.....	.....	
14,250	57,000	.009333	.001000	.....	.....	
14,500	58,000	.010400	.001067	.....	.....	
14,750	59,000	.011400	.001000	.....	.....	
15,000	60,000	.012700	.001300	.....	.....	
15,500	62,000	.014833	.002133	.....	.....	
16,000	64,000	.017000	.002167	.....	.....	
16,500	66,000	.019667	.002667	.....	.....	
17,000	68,000	.022000	.002333	.....	.....	
17,500	70,000	.024833	.002833	.....	.....	
18,000	72,000	.028000	.003167	.....	.....	
18,500	74,000	.031333	.003333	.....	.....	
19,000	76,000	.035333	.004000	.....	.....	
19,500	78,000	.040000	.004667	.....	.....	
20,000	80,000	.046667	.006667	.....	.....	
20,500	82,000	.053333	.006666	.....	.....	
21,000	84,000	.064667	.011334	.....	.....	
21,500	86,000	.0867	.022033	.....	.....	
21,960	87,840	.1367	.0500	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	87,840
Elastic limit per square inch of original section	do...	48,000
Elongation per inch after rupture	inch..	0.2500
Elongation per inch under strain at elastic limit	do...	.001600
Reduction in diameter at point of rupture	do...	.175
Reduction in area after rupture, per centum of original section		52.2
Position of rupture		at middle of stem
Character of broken surface		silky; traces of granulation
Elongation of inch sections		″.16, ″.44*, ″.15

No. 2211.

Marks, $\frac{8\ T\ Cex}{T_2\ M}$
Diameter, ″.565
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000267	.000134	0.	.....	
3,750	15,000	.000467	.000200	0.	.....	
5,000	20,000	.000667	.000200	0.	.....	
6,250	25,000	.000833	.000166	0.	.....	
7,500	30,000	.001000	.000167	0.	.....	
8,750	35,000	.001133	.000133	0.	.....	
10,000	40,000	.001300	.000167	0.	.....	
11,250	45,000	.001433	.000133	0.	.....	Elastic limit.
11,500	46,000	.001633	.000200	.....	.....	
11,750	47,000	.001867	.0 0234	.....	.....	
12,000	48,000	.003033	.001266	.....	.....	
12,250	49,000	.004067	.001034	.....	.....	
12,500	50,000	.005233	.001166	.003367	.003367	
12,750	51,000	.005833	.0006.0	.....	.....	
13,000	52,000	.007067	.001234	.....	.....	
13,250	53,000	.007833	.000766	.....	.....	
13,500	54,000	.009167	.001334	.....	.....	
13,750	55,000	.010000	.000833	.....	.....	
14,000	56,000	.011333	.001333	.....	.....	
14,250	57,000	.012500	.001167	.....	.....	
14,500	58,000	.013600	.001100	.....	.....	
14,750	59,000	.01 800	.001200	.....	.....	
15,000	60,000	.016133	.001333	.....	.....	
15,500	62,000	.018967	.002834	.....	.....	
16,000	64,000	.021000	.002033	.....	.....	
16,500	66,000	.023333	.002333	.....	.....	
17,000	68,000	.025800	.002467	.....	.....	
17,500	70,000	.029333	.003533	.....	.....	
18,000	72,000	.033000	.003667	.....	.....	
18,500	74,000	.037167	.004167	.....	.....	
19,000	76,000	.042000	.004833	.....	.....	
19,500	78,000	.049333	.007333	.....	.....	
20,000	80,000	.057333	.008000	.....	.....	
20,500	82,000	.0700	.012667	.....	.....	
21,000	84,000	.0933	.0233	.....	.....	
21,360	85,440	.1400	.0467	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	85,440
Elastic limit per square inch of original section	do...	45,000
Elongation per inch after rupture	inch..	0.2333
Elongation per inch under strain at elastic limit	do...	.001433
Reduction in diameter at point of rupture	do...	.125
Reduction in area after rupture, per contum of original section		39.2
Position of rupture		″.10 from middle of stem
Character of broken surface		granular; dull spot at circumference
Elongation of inch sections		″.18, ″.36*, ″.16

No. 625.

Marks, $\frac{8\ T\ Cex}{T.\ O}$
Length, 5".009.
Diameter, ".799.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000133	.000133	0.	.....	
5,000	10,000	.000267	.000134	0.	.....	
7,500	15,000	.000433	.000166	0.	.....	
10,000	20,000	.000600	.000167	0.	.....	
12,500	25,000	.000767	.000167	0.	.....	
15,000	30,000	.000933	.000166	0.	.....	
17,500	35,000	.001067	.000134	.000033	.000033	
19,000	38,000	.001200	.000133	.....	.....	
19,500	39,000	.001267	.000067	.....	.....	
20,000	40,000	.001300	.000033	.000033	0.	
20,500	41,000	.001333	.000033	.....	.....	
21,000	42,000	.001367	.000034	.....	.....	
21,500	43,000	.001400	.000033	.....	.....	
22,000	44,000	.001433	.000033	.....	.....	
22,500	45,000	.001467	.000034	.000067	.000034	
23,000	46,000	.001500	.000033	.....	.....	Elastic limit.
23,500	47,000	.001600	.000100	.....	.....	
24,000	48,000	.002500	.000900	.....	.....	
24,500	49,000	.008433	.005933	.....	.....	
25,000	50,000	.009000	.000567	.006967	.000900	
38,850	77,700	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	46,000
Compression per inch under stress at elastic limit	inch..	0.001500
Ultimate strength per square inch of original section	pounds..	77,700
Manner of failure		triple flexure

No. 626.

Marks, $^{8\ T\ Cex}_{T_8\ M}$
Length, 5″.011.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000133	.000133	0.	.....	
5,000	10,000	.000267	.000134	0.	.....	
7,500	15,000	.000400	.000133	0.	.....	
10,000	20,000	.000600	.000200	0.	.....	
12,500	25,000	.000767	.000167	0.	.....	
15,000	30,000	.000967	.000200	.000067	.000067	
17,500	35,000	.001167	.000200	.000133	.000066	
20,000	40,000	.001333	.000166	.000233	.000100	
20,500	41,000	.001400	.000067	.....	.....	
21,000	42,000	.001467	.000067	.....	.....	
21,500	43,000	.001500	.000033	.....	.....	
22,000	44,000	.001600	.000100	.....	.....	
22,500	45,000	.001600	0.	.000333	.000100	
23,000	46,000	.001700	.000100	.....	.....	
23,500	47,000	.001767	.000067	.....	.....	Elastic limit.
24,000	48,000	.001867	.000100	.....	.....	
24,500	49,000	.002067	.000200	.....	.....	
25,000	50,000	.002500	.000433	.000933	.000600	
25,500	51,000	.003500	.001000	.....	.....	
26,000	52,000	.004767	.001267	.....	.....	
41,300	82,600	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	47,000
Compression per inch under stress at elastic limit	inch..	0.001767
Ultimate strength per square inch of original section	pounds..	82,600
Manner of failure		triple flexure

No. 627.

Marks, $\frac{8\ T\ Cex}{R_s}$
Length, 3″.387.
Diameter, ″.799.
Sectional area, .50 square inch.

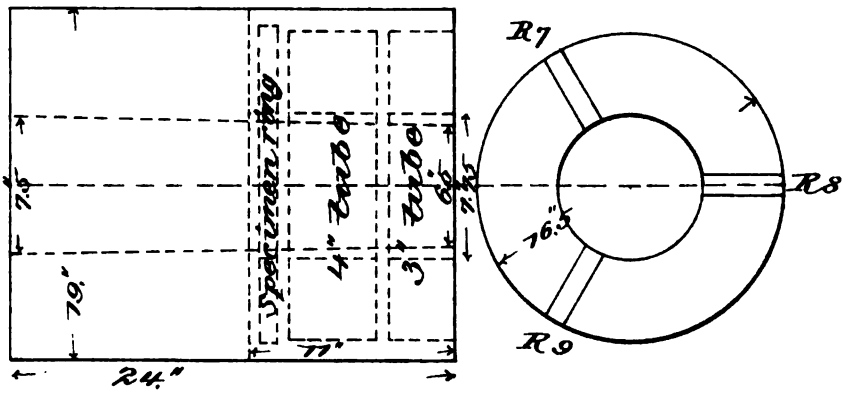
Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	0.	.....	
5,000	10,000	.000250	.000150	0.	.....	
7,500	15,000	.000350	.000100	0.	.....	
10,000	20,000	.000500	.000150	0.	.....	
12,500	25,000	.000650	.000150	−.000050	−.000050	
15,000	30,000	.000750	.000100	−.000030	0.	
17,500	35,000	.000900	.000150	−.000050	0.	
20,000	40,000	.001000	.000100	−.000100	−.000050	
20,500	41,000	.000900	−.000100	.....	.....	
21,000	42,000	.001000	.000100	.....	.....	
21,500	43,000	.001050	.000050	.....	.....	
22,000	44,000	.001100	.000050	.....	.....	
22,500	45,000	.001100	0.	−.000200	−.000100	
23,000	46,000	.001050	−.000050	.....	.....	
23,500	47,000	.001000	−.000050	.....	.....	
24,000	48,000	.001000	0.	.....	.....	Elastic limit.
24,500	49,000	.001400	.000400	.....	.....	
25,000	50,000	.003300	.001900	.001700	.001900	
25,500	51,000	.004650	.001350	.....	.....	
26,000	52,000	.005850	.001200	.....	.....	
26,500	53,000	.006750	.000900	.....	.....	
27,000	54,000	.007500	.000750	.....	.....	
53,000	106,000	.....	.....	.....	.....	Test discontinued.

General summary.

Elastic limit per square inch of original section	pounds..	48,000
Compression per inch under stress at elastic limit	inch..	0.001000
Manner of failure		triple flexure
Length of specimen after the test		2″.94
Middle deflection		″.14

Frictional Resistance Experiments

Tube cylinder



H Ex 31 49 2

No. 679.

Marks, Ex $\overset{8\ R}{T\ (F\ R)}$ $\overset{}{R,}$
Length, 4″.005.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	0.	.....	
5,000	10,000	.000233	.000133	0.	.....	
7,500	15,000	.000433	.000200	0.	.....	
10,000	20,000	.000600	.000167	0.	.....	
12,500	25,000	.000767	.000167	0.	.....	
15,000	30,000	.000933	.000166	0.	.....	
17,500	35,000	.001100	.000167	0.	.....	
20,000	40,000	.001333	.000233	.000033	.000033	Elastic limit.
20,500	41,000	.001833	.000500	.....	.....	
21,000	42,000	.001967	.000134	.....	.....	
21,500	43,000	.002400	.000433	.....	.....	
22,000	44,000	.003067	.000667	.....	.....	
22,500	45,000	.003667	.000600	.....	.....	
23,000	46,000	.004667	.001000	.....	.....	
23,500	47,000	.005333	.000666	.....	.....	
24,000	48,000	.006467	.001134	.....	.....	
24,500	49,000	.007267	.000800	.....	.....	
25,000	50,000	.008167	.000900	.....	.....	
25,500	51,000	.009067	.000900	.....	.....	
26,000	52,000	.009867	.000800	.....	.....	
26,500	53,000	.010867	.001000	.....	.....	
27,000	54,000	.011500	.000633	.....	.....	
27,500	55,000	.012333	.000833	.....	.....	
45,700	91,400	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	40,000
Compression per inch under stress at elastic limit	inch..	0.001333
Ultimate strength per square inch of original section	pounds..	91,400
Manner of failure		triple flexure

No. 680.

Marks, Ex $\overset{8\,R}{T}\,(F\,R)_{R_8}$
Length, 4″.004.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000133	.000133	0.	.....	
5,000	10,000	.000300	.000167	0.	.....	
7,500	15,000	.000167	.000167	0.	.....	
10,000	20,000	.000633	.000166	0.	.....	
12,500	25,000	.000800	.000167	0.	.....	
15,000	30,000	.000967	.000167	0.	.....	
17,500	35,000	.001133	.000166	0.	.....	
18,000	36,000	.001167	.000034	.....	.....	
18,500	37,000	.001200	.000033	.....	.....	
19,000	38,000	.001267	.000067	.....	.....	
19,500	39,000	.001333	.000066	.....	.....	
20,000	40,000	.001367	.000034	.....	.....	Elastic limit.
20,500	41,000	.001600	.000233	.....	.....	
21,000	42,000	.001733	.000133	.....	.....	
21,500	43,000	.002633	.000900	.....	.....	
22,000	44,000	.003333	.000700	.....	.....	
22,500	45,000	.004167	.000834	.....	.....	
23,000	46,000	.004967	.000800	.....	.....	
23,500	47,000	.005967	.001000	.....	.....	
24,000	48,000	.006933	.000966	.....	.....	
24,500	49,000	.007833	.000900	.....	.....	
25,000	50,000	.008667	.000834	.....	.....	
25,500	51,000	.009533	.000866	.....	.....	
26,000	52,000	.010333	.000800	.....	.....	
26,500	53,000	.011233	.000900	.....	.....	
27,000	54,000	.012000	.000767	.....	.....	
27,500	55,000	.012900	.000900	.....	.....	
45,500	91,000	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds .	40,000
Compression per inch under stress at elastic limit	inch..	0.001367
Ultimate strength per square inch of original section	pounds..	91,000
Manner of failure		triple flexure

No. 681.

Marks, Ex $\overset{8\ R}{T\ (F\ R)}$ $\overset{}{R_8}$
Length, 4″.005.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000100	.000100	0.	.....	
5,000	10,000	.000267	.000167	0.	.....	
7,500	15,000	.000433	.000166	0.	.....	
10,000	20,000	.000600	.000167	0.	.....	
12,500	25,000	.000767	.000167	0.	.....	
15,000	30,000	.000933	.000166	0.	.....	
17,500	35,000	.001100	.000167	.000033	.000033	
18,000	36,000	.001133	.000033	.....	.....	
18,500	37,000	.001200	.000067	.....	.....	
19,000	38,000	.001233	.000033	.....	.....	Elastic limit.
19,500	39,000	.001333	.000100	.....	.....	
20,000	40,000	.001567	.000234	.....	.....	
20,500	41,000	.002100	.000533	.....	.....	
21,000	42,000	.002533	.000433	.....	.....	
21,500	43,000	.003233	.000700	.....	.....	
22,000	44,000	.004000	.000767	.....	.....	
22,500	45,000	.004833	.000833	.....	.....	
23,000	46,000	.005667	.000834	.....	.....	
23,500	47,000	.006667	.001000	.....	.....	
24,000	48,000	.007667	.001000	.....	.....	
24,500	49,000	.008667	.001000	.....	.....	
25,000	50,000	.009367	.000700	.....	.....	
25,500	51,000	.010200	.000833	.....	.....	
26,000	52,000	.011167	.000967	.....	.....	
26,500	53,000	.012000	.000833	.....	.....	
27,000	54,000	.012833	.000833	.....	.....	
27,500	55,000	.013767	.000934	.....	.....	
44,700	89,400	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	38,000
Compression per inch under stress at elastic limit	inch..	0.001233
Ultimate strength per square inch of original section	pounds..	89,400
Manner of failure		triple flexure

FRICTIONAL RESISTANCE

OF

STEEL HOOPS

SHRUNK ON STEEL TUBES.

FRICTIONAL RESISTANCE

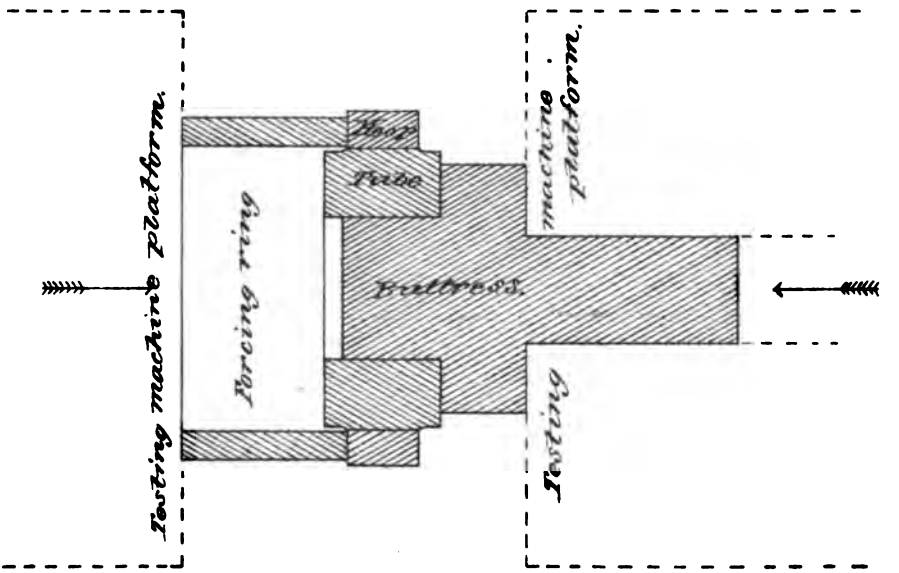
OF

STEEL HOOPS

SHRUNK ON STEEL TUBES.

Frictional resistance experiments

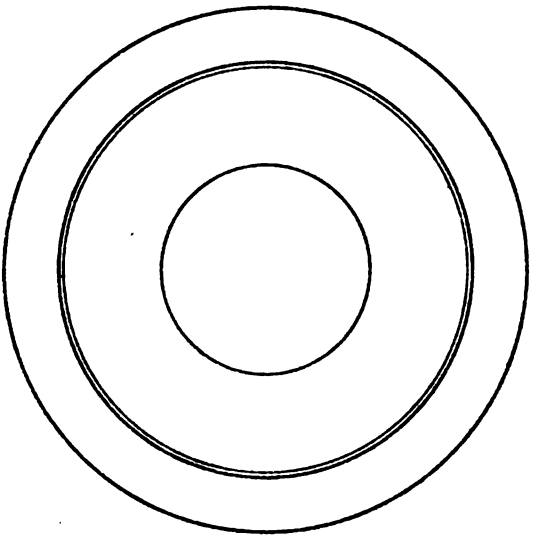
Showing attachments in position for unhooping.

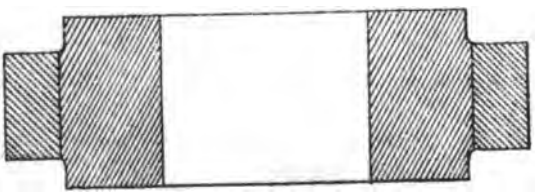


H Ex 31 492

Frictional resistance experiments

4" hoop and tube

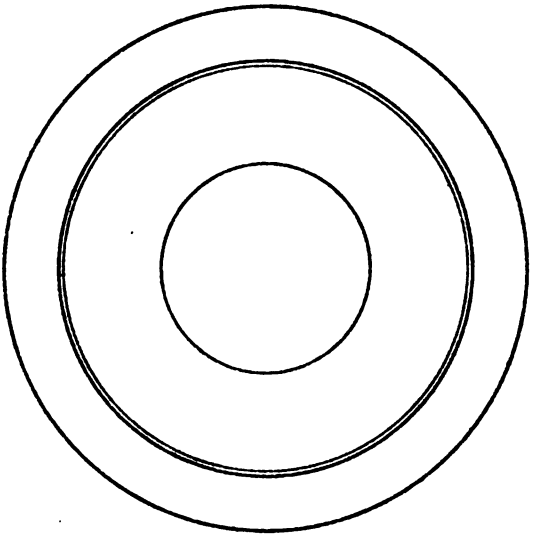


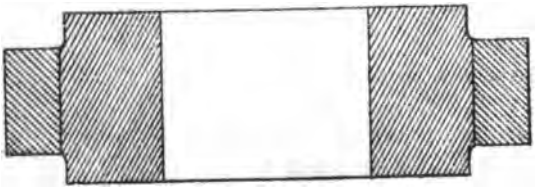


H Ex 31 492

Frictional resistance experiments

4" hoop and tube

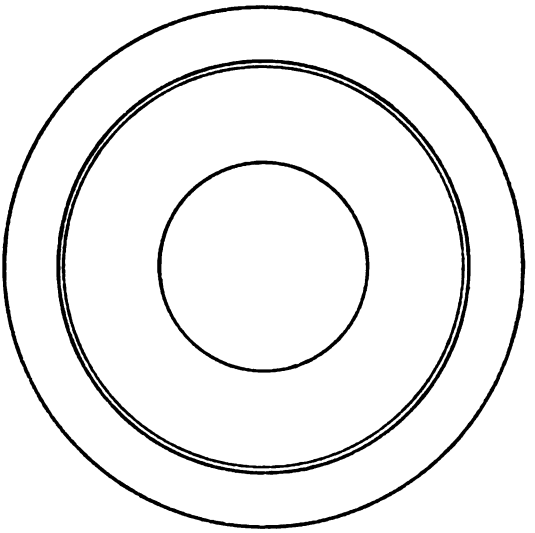




H Ex 31 492

Frictional resistance experiments

3" hoop and tube



H Ex 31 49 2

FRICTIONAL RESISTANCE OF STEEL HOOPS SHRUNK ON STEEL TUBES.

The hoops and tubes were received at the Watertown Arsenal in their assembled state, having been prepared and shrunk together at West Point foundry under the supervision of Lieut. R. Birnie, jr., Ordnance Department, U. S. A.

The estimated temperature of the 3-inch hoop when taken from the furnace to assemble was 470° Fahr.; that of the 4-inch hoop 515° Fahr.

At Watertown Arsenal the accessible diameters were measured before unhooping and again after unhooping, the several diameters making equal angles with each other. The unhooping was done by forcing the hoops from the tubes in the direction of their axes.

One end of a tube rested against a buttress in front of the flat platform of the testing-machine, a cast-iron ring being used between the opposite platform and the hoop.

In the details of the tests are shown the apparent movement of the hoops on the tubes during the progress of the loading up to the maximum resistance, and afterwards the diminishing loads on the hoops at intervals until they were wholly removed from the tubes.

Intervals of rest of longer or shorter duration were allowed, and the effect on the frictional resistance observed.

The hoops did not slip over the tubes with a smooth continuous movement, but with a series of sudden slips and throbs, during which there were fluctuations of the loads.

Water was sprinkled upon the assembled parts while they were hot, which is thought to account for its presence on the frictional surfaces after unhooping.

Difference in shrinkage diameters before and after unhooping:
- 3-inch hoop and tube ..... inch.. 0.016434
- 4-inch hoop and tube ..... do... 0.016350

Maximum frictional resistance found:
- 3-inch hoop and tube ..... pounds.. 265,800
- 4-inch hoop and tube ..... do.... 404,100

EXTERIOR DIAMETERS OF 3″ HOOP.

BEFORE UNHOOPING.

[In inches.]

Distance from top.	Diameters.				Means.
	1	2	3	4	
0.5	20.0165	20.0164	20.0156	20.0158	20.016075
1.5	20.0164	20.0162	20.0153	20.0152	20.015775
2.5	20.0159	20.0158	20.0146	20.0147	20.015250

Mean ..... 20″.0157

AFTER UNHOOPING.

0.5	20.0042	20.0043	20.0041	20.0042	20.004200
1.5	20.0041	20.0038	20.0038	20.0038	20.003875
2.5	20.0036	20.0034	20.0033	20.0033	20.003400

Mean ..... 20″.003825. Restoration ..... 0″.011875

EXTERIOR DIAMETERS OF TUBE WITH 4″ HOOP.

AFTER UNHOOPING.

[In inches.]

Distance from top.	Diameters.				Means.
	1	2	3	4	
0.5	15.7617	15.7620	15.7620	15.7620	15.761925
2.0	15.7623	15.7624	15.7625	15.7624	15.762400
3.5	15.7628	15.7633	15.7631	15.7628	15.763000

Mean ..... 15″.762442

FRICTIONAL RESISTANCE BETWEEN TUBE AND 3″ HOOP.

DETAILS.

Applied loads.	Total movement.	Time.	Remarks.
Pounds.	*Inches.*	*Seconds.*	
50,000	0.	.....	Initial load.
89,000	0.	.....	
100,000	.0006	.....	Micrometer measurements were taken between the hoop and face of platform of testing machine. Hence the apparent movement of the hoop on the tube includes the compression of the cast-iron platform.
150,000	.0014	.....	
200,000	.0024	.....	
220,000	.0025	.....	
240,000	.0035	.....	
245,000	.0038	.....	
250,000	.0030	.....	
260,000	.0030	.....	
265,800	.....	.....	Maximum frictional resistance. Sudden slip of hoop on tube.
.....	.0504	.....	After the slip.
132,000	.....	.....	Continues the movement.
130,400	.1138	.....	

[Micrometer measurements now taken from platform to platform.]

128,000	.1138	.....	Rested 10 minutes.
137,000	.1140	.....	
140,000	.1140	.....	
143,900	.....	.....	Maximum resistance after the rest. Sudden slip load and reading now.
116,000	.1220	.....	
127,000	.1257	.....	
125,000	.1260	.....	Rested about 3 minutes.
136,500	.1275	.....	
140,000	.....	.....	Sudden slip.
122,000	.1338	.....	After slip.
128,000	.2650	.....	Movement continues.

The hoop kept in motion, the resistance varying from 128,000 to 138,000 pounds, with unsteady movement as before. A final sudden slip of the hoop reduced the load to 113,000 pounds, the total movement being ″.4970, when the test was discontinued.

Contact surfaces in sight were slightly rusty, which it is thought took place after the surfaces were exposed to the air.

After a rest under zero load of 25 hours 45 minutes the loading was renewed.

FRICTIONAL RESISTANCE BETWEEN TUBE AND 3″ HOOP—Continued.

DETAILS—Continued.

Applied loads.	Total movement.	Time.	Remarks.
Pounds.	*Inches.*	*Seconds.*	
113,000	.4970	.....	
145,400	.....	.....	Maximum resistance after above rest.
104,200	.5074	.....	After sudden slip.
142,800	.52	.....	
133,000	.53	38	
136,000	.54	34	
129,000	.55	19	
141,000	.56	19	
136,000	.575	28	
137,000	.588 .59	24	
137,000	.60	22	
137,000	.612	22	
135,000	.625 .6375	19 23	
138,500	.64	.....	
136,800	.65	24	
134,000	.662	18	
136,500	.675	20	
129,800	.684	15	
136,800	.698	19	
122,000	.7045	10	
136,400	.7165	18	
127,000	.725	13	
135,500	.7375	15	
128,000	.746	12	
128,900	.7545	12	
130,000	.764	13	
128,200	.775	11	
133,500	.786	18	
128,000	.794	11	
128,000	.804	14	
128,800	.814	11	
128,000	.8225	13	
128,400	.832	13	
128,100	.842	11	
135,000	.856	18	
129,000	.866	13	
128,000	.875	13	
128,500	.886	14	
128,200	.896	13	
127,000	.905	13	
129,000	.916	14	
135,200	.931	19	
128,000	.941	15	
127,000	.951	13	
128,200	.961	13	
127,100	.972	14	
127,100	.983	15	
127,400	.994	13	
127,200	1.00	19	
98,000	1.00	.....	Rested 15 minutes.
125,000	.....	.....	Maximum resistance after above rest.
117,000	1.10	.....	Number of throbs between readings.
115,000	1.20	48	
113,000	1.30	52	
109,000	1.40	51	
105,000	1.50	52	
101,500	1.60	54	
97,500	1.70	47	11
91,000	1.80	48	12
84,000	1.90	50	13
75,000	2.00	47	14
68,000	2.10	48	14
63,800	2.20	41	16
57,000	2.30	44	16
52,500	2.40	42	17
47,500	2.50	42	22
42,000	2.60	41	
39,900	2.70	34	
37,400	2.80	73	
31,000	2.90	73	

Frictional surface of the tube well polished, but retains marks of the turning tool.

Corresponding surface of the hoop shows no material change in its appearance resulting from the test.

FRICTIONAL RESISTANCE BETWEEN TUBE AND 4″ HOOP.

DETAILS.

Applied loads.	Total movement.	Time.	Remarks.
Pounds.	*Inches.*	*Seconds.*	
50,000	0.	.....	Initial load.
100,000	.0024	.....	Micrometer readings taken from platform to platform of testing-machine.
150,000	.0048	.....	
200,000	.0068	.....	
220,000	.0079	.....	
240,000	.0089	.....	
260,000	.0096	.....	
280,000	.0102	.....	
300,000	.0109	.....	
320,000	.0118	.....	
340,000	.0127	.....	
350,000	.0132	.....	
360,000	.0138	.....	
370,000	.0143	.....	
380,000	.0146	.....	
390,000	.0149	.....	
400,000	.0154	.....	
404,100	.....	.....	Maximum frictional resistance. Sudden slip.
129,700	.0848	.....	Load and reading after slip.
211,000	.0930	.....	Continues the motion.
173,500	.2581	.....	Rested 10 minutes.
187,800	.....	.....	Maximum resistance after above rest. Motion caused without sudden slip
193,800	.39	.....	
202,000	.40	.....	
191,700	.41	65	
192,000	.42	27	
191,800	.43	32	
196,200	.44	31	
192,900	.45	24	
193,800	.46	23	
195,500	.47	25	
183,000	.48	7	
189,000	.49	.....	
186,000	.50	.....	
187,200	.51	9	
188,200	.52	9	
185,500	.53	9	
188,100	.54	9	
186,000	.55	9	
187,800	.56	8	
189,100	.57	10	
187,800	.58	9	
190,400	.59	10	
189,200	.60	.....	
189,700	.61	9	
190,300	.62	8	
188,800	.63	9	
190,600	.64	10	
190,200	.65	10	
190,900	.66	10	
191,200	.67	8	
190,400	.68	9	
191,400	.69	10	
190,600	.70	9	
191,600	.71	9	
189,800	.72	9	
194,000	.73	8	Sudden slip
188,000	.74	10	
184,000	.75	8	Do.
190,400	.76	9	Do.
183,000	.77	8	Do.
188,000	.78	10	Do.
189,000	.79	11	Do.
180,000	.80	8	Do.
187,000	.81	11	Do.
189,000	.82	8	Do.
188,000	.83	9	
188,500	.84	11	
188,000	.85	6	
188,900	.86	13	
188,000	.87	6	
189,000	.88	12	
180,000	.89	9	Do.
178,000	.90	5	Do.
179,000	.91	15	Do.
.....	.92	6	
183,000	.93	11	

FRICTIONAL RESISTANCE BETWEEN TUBE AND 4" HOOP—Continued.

DETAILS—Continued.

Applied loads.	Total movement.	Time.	Remarks.
Pounds.	*Inches.*	*Seconds.*	
.....	.94	11	Sudden slip.
176,000	.95	5	
189,800	.96	14	
182,900	.98	19	
173,900	1.00	.....	Test discontinued. Time, 12.11 p. m.

Friction surfaces slightly rusty, occurring after exposure to the air. A few drops of water observed at the joint of the hoop and tube after the discontinuance of the test.

Test resumed after a rest of 26 hours 35 minutes under zero load.

Applied loads.	Total movement.	Time.	Remarks.
Pounds.	*Inches.*	*Seconds.*	
100,000	1.00	.....	
182,900	1.0060	.....	
190,000	1.0085	.....	
198,800	.....	.....	Sudden slip.
145,000	1.0234	.....	Load and reading after slip.
221,000	.....	.....	Maximum resistance after resting. Sudden slip.
171,000	1.0817	.....	
182,000	.....	.....	Continues the movement.
186,000	1.10	.....	
202,000	1.1375	.....	
178,000	1.145	49	
208,000	1.17	34	
188,000	1.1865	34	
183,000	1.19	25	
189,000	1.205	13	
182,000	1.218	26	
179,000	1.220	18	
193,000	1.238	19	
175,000	1.24	18	
185,000	1.255	14	
176,000	1.267	24	
179,000	1.27	13	
182,000	1.2816	11	
174,800	1.293	21	
178,000	1.307	20	
172,000	1.31	12	
172,800	1.319	7	
170,000	1.332	18	
172,000	1.344	19	
174,800	1.357	18	
166,000	1.36	11	
171,000	1.369	7	
173,800	1.382	20	
169,800	1.393	17	
173,000	1.407	19	
164,000	1.41	11	
174,000	1.425	13	
165,000	1.433	18	
166,000	1.444	12	
174,000	1.4605	24	
163,000	1.47	18	
168,500	1.481	11	
170,000	1.477	23	
168,000	1.493	23	
162,000	1.503	15	
163,500	1.5135	14	
163,000	1.525	13	
164,500	1.5375	20	
158,000	1.54	9	
161,000	1.549	7	
163,000	1.561	14	
161,000	1.572	16	
161,500	1.585	16	
159,500	1.5955	15	
161,000	1.6080	16	
158,000	1.619	17	
159,800	1.6315	13	

FRICTIONAL RESISTANCE BETWEEN TUBE AND 4″ HOOP—Continued.

DETAILS—Continued.

Applied loads.	Total movement.	Time.	Remarks.
Pounds.	*Inches.*	*Seconds.*	
161,500	1.649	22	
160,500	1.6645	20	
148,000	1.672	10	
159,500	1.689	21	
158,500	1.7045	19	
140,000	1.7115	11	
143,000	1.7190	7	
141,000	1.728	10	
148,000	1.736	9	
153,000	1.747	23	
144,000	1.753	18	
151,000	1.762	22	
149,500	1.77	23	
159,500	1.785	34	
139,000	1.79	17	
149,000	1.799	23	
148,000	1.808	20	
143,000	1.8145	18	
148,000	1.823	23	
148,000	1.832	21	
154,000	1.846	33	
139,000	1.8515	17	
145,000	1.86	20	
144,000	1.868	20	
142,000	1.875	19	
143,000	1.883	20	
152,000	1.8975	30	
134,000	1.9020	17	
143,500	1.91	20	
153,000	1.925	29	
123,000	1.998	.....	
116,000	.....	.....	Rested 15 minutes.
139,500	.....	.....	Sudden slip.
145,000	.....	.....	Maximum resistance after 15 minutes' rest.
128,000	2.12	.....	
123,000	2.22	54	

			Number of throbs between readings.
114,000	2.30	46	12
110,000	2.42	39	14
105,000	2.50	44	15
99,400	2.62	50	15
93,800	2.72	49	16
88,000	2.82	45	17
83,500	2.92	45	18
78,500	3.02	44	18
74,300	3.12	48	19
69,200	3.22	46	18
64,600	3.42	87	34
59,900	3.52	46	14
54,500	3.62	44	13
51,500	3.72	43	15
51,800	3.82	42	11
46,000	3.93	58	12

After a movement of the hoop of 1″.10 there was a succession of sudden slips, continuing through the remainder of the test.

Frictional surface of the tube well polished in a higher degree than the surface of the tube with the 3″ hoop. The remaining tool-marks also were deeper.

No material change produced on the corresponding surface of the hoop.

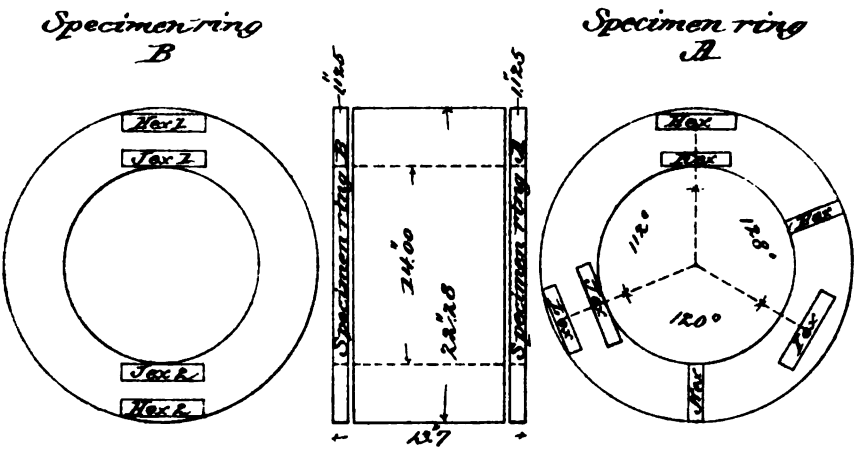
REMNANT OF WHITWORTH STEEL JACKET CYLINDER.

Specimens taken from a section of the jacket which was shrunk upon a wrought-iron tube, and removed from shrinkage by the application of high furnace heat.

[See report of Chief of Ordnance, U. S. Army, 1885, Appendix 31 for details of shrinkage.]

Remnant of Jacket cylinder.

Experimental section.



H Ex 31 49 2

No. 1171.

Marks, H E X.
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000067	.000067	0.	.....	
2,500	10,000	.000233	.000166	0.	.....	
3,750	15,000	.000400	.000167	0.	.....	
5,000	20,000	.000567	.000167	0.	.....	
6,250	25,000	.000733	.000166	0.	.....	
7,500	30,000	.000900	.000167	0.	.....	
8,750	35,000	.001067	.000167	0.	.....	
10,000	40,000	.001233	.000166	0.	.....	
11,250	45,000	.001400	.000167	0.	.....	
11,500	46,000	.001400	.0	.....	.....	
11,750	47,000	.001433	.000033	.....	.....	
12,000	48,000	.001467	.000034	.....	.....	
12,250	49,000	.001500	.000033	.....	.....	
12,500	50,000	.001567	.000067	0.	.....	
12,750	51,000	.001600	.000033	.....	.....	
13,000	52,000	.001633	.000033	.....	.....	
13,250	53,000	.001667	.000034	.....	.....	
13,500	54,000	.001700	.000033	.....	.....	
13,750	55,000	.001733	.000033	.000033	.000033	Elastic limit.
14,000	56,000	.002433	.000700	.....	.....	
14,250	57,000	.004833	.002400	.....	.....	
14,500	58,000	.006067	.001234	.....	.....	
14,750	59,000	.006567	.000500	.....	.....	
15,000	60,000	.007100	.000533	.004900	.004867	
15,500	62,000	.008133	.001033	.....	.....	
16,000	64,000	.009733	.001600	.....	.....	
16,500	66,000	.011233	.001500	.....	.....	
17,000	68,000	.012667	.001434	.....	.....	
17,500	70,000	.014367	.001700	.....	.....	
18,000	72,000	.015967	.001600	.....	.....	
18,500	74,000	.017700	.001733	.....	.....	
19,000	76,000	.019433	.001733	.....	.....	
19,500	78,000	.021433	.002000	.....	.....	
20,000	80,000	.023600	.002167	.....	.....	
20,500	82,000	.025733	.002133	.....	.....	
21,000	84,000	.028667	.002934	.....	.....	
21,500	86,000	.030900	.002233	.....	.....	
22,000	88,000	.034000	.003100	.....	.....	
22,500	90,000	.037433	.003433	.....	.....	
23,000	92,000	.040767	.003334	.....	.....	
23,500	94,000	.045167	.004400	.....	.....	
24,000	96,000	.051333	.006166	.....	.....	
24,500	98,000	.058000	.006667	.....	.....	
25,000	100,000	.066667	.008667	.....	.....	
25,500	102,000	.0867	.020033	.....	.....	
25,990	103,960	.1200	.0333	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	103,960
Elastic limit per square inch of original section	do...	55,000
Elongation per inch after rupture	inch..	0.1967
Elongation per inch under strain at elastic limit	do...	.001733
Reduction in diameter at point of rupture	do...	.134
Reduction in area after rupture, per centum of original section		41.9
Position of rupture		1″.00 from neck
Character of broken surface		silky
Elongation of inch sections		″.30*, ″.19, ″.10

No. 1172.

Marks, I E X.
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000267	.000134	0.	.....	
3,750	15,000	.000400	.000133	0.	.....	
5,000	20,000	.000567	.000167	0.	.....	
6,250	25,000	.000733	.000166	0.	.....	
7,500	30,000	.000900	.000167	0.	.....	
8,750	35,000	.001033	.000133	0.	.....	
10,000	40,000	.001167	.000134	0.	.....	
11,250	45,000	.001367	.000200	.000033	.000033	
11,500	46,000	.001400	.000033	.....	.....	
11,750	47,000	.001433	.000033	.....	.....	
12,000	48,000	.001500	.000067	.....	.....	Elastic limit.
12,250	49,000	.001767	.000267	.....	.....	
12,500	50,000	.005167	.003400	.003767	.003734	
12,750	51,000	.008333	.003166	.....	.....	
13,000	52,000	.009367	.001034	.....	.....	
13,250	53,000	.009700	.000333	.....	.....	
13,500	54,000	.010400	.000700	.....	.....	
13,750	55,000	.011433	.001033	.009367	.005600	
14,000	56,000	.012400	.000967	.....	.....	
14,250	57,000	.012833	.000433	.....	.....	
14,500	58,000	.013767	.000934	.....	.....	
14,750	59,000	.015267	.001500	.....	.....	
15,000	60,000	.016167	.000900	.013767	.004400	
15,500	62,000	.017767	.001600	.....	.....	
16,000	64,000	.020700	.002933	.....	.....	
16,500	66,000	.023000	.002300	.....	.....	
17,000	68,000	.025667	.002667	.....	.....	
17,500	70,000	.028667	.003000	.....	.....	
18,000	72,000	.031333	.002666	.....	.....	
18,500	74,000	.034333	.003000	.....	.....	
19,000	76,000	.038333	.004000	.....	.....	
19,500	78,000	.042700	.004367	.....	.....	
20,000	80,000	.047667	.004967	.....	.....	
20,500	82,000	.055000	.007333	.....	.....	
21,000	84,000	.063167	.008167	.....	.....	
21,500	86,000	.076000	.012833	.....	.....	
22,000	88,000	.0967	.0207	.....	.....	
22,500	90,000	.1333	.0366	.....	.....	
22,510	90,040	.1533	.0200	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	90,040
Elastic limit per square inch of original section	do...	48,000
Elongation per inch after rupture	inch..	0.2400
Elongation per inch under strain at elastic limit	do...	.0015
Reduction in diameter at point of rupture	do...	.154
Reduction in area after rupture, per centum of original section		47.2
Position of rupture		".1 from middle of stem
Character of broken surface		silky
Elongation of inch sections		".14, ".40*, ".18

No. 1173.

Marks, J E X.
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000200	.000200	.000033	.000033	
2,500	10,000	.000367	.000167	.000033	0.	
3,750	15,000	.000500	.000133	.000033	0.	
5,000	20,000	.000700	.000200	.000033	0.	
6,250	25,000	.000867	.000167	.000033	0.	
7,500	30,000	.001033	.000166	.000033	0.	
8,750	35,000	.001200	.000167	.000033	0.	
10,000	40,000	.001367	.000167	.000067	.000034	
11,250	45,000	.001500	.000133	.000067	0.	
11,500	46,000	.001500	0.	.....	.....	
11,750	47,000	.001533	.000033	.....	.....	
12,000	48,000	.001600	.000067	.....	.....	
12,250	49,000	.001633	.000033	.....	.....	
12,500	50,000	.001667	.000034	.000100	.000033	
12,750	51,000	.001700	.000033	.....	.....	
13,000	52,000	.001733	.000033	.....	.....	
13,250	53,000	.001767	.000034	.....	.....	
13,500	54,000	.001800	.000033	.....	.....	
13,750	55,000	.001833	.000033	.000100	0.	
14,000	56,000	.001867	.000034	.....	.....	
14,250	57,000	.001933	.000066	.....	.....	Elastic limit.
14,500	58,000	.002000	.000067	.....	.....	
		.002200	.000200	.....	.....	
14,750	59,000	.002533	.000333	.....	.....	
15,000	60,000	.006233	.003700	.004100	.004000	
15,500	62,000	.007333	.001100	.....	.....	
16,000	64,000	.008733	.001400	.....	.....	
16,500	66,000	.010067	.001334	.....	.....	
17,000	68,000	.012333	.002266	.....	.....	
17,500	70,000	.013733	.001400	.....	.....	
18,000	72,000	.015267	.001534	.....	.....	
18,500	74,000	.017067	.001800	.....	.....	
19,000	76,000	.018733	.001666	.....	.....	
19,500	78,000	.020433	.001700	.....	.....	
20,000	80,000	.022500	.002067	.....	.....	
20,500	82,000	.024767	.002267	.....	.....	
21,000	84,000	.027100	.002333	.....	.....	
21,500	86,000	.029700	.002600	.....	.....	
22,000	88,000	.032467	.002767	.....	.....	
22,500	90,000	.036100	.003633	.....	.....	
23,000	92,000	.039667	.003567	.....	.....	
23,500	94,000	.045500	.005833	.....	.....	
24,000	96,000	.050667	.005167	.....	.....	
24,500	98,000	.056000	.005333	.....	.....	
25,000	100,000	.064000	.008000	.....	.....	
25,500	102,000	.080000	.016000	.....	.....	
26,000	104,000	.1000	.0200	.....	.....	
26,050	104,200	.1267	.0267	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	104,200
Elastic limit per square inch of original section	do...	57,000
Elongation per inch after rupture	inch..	0.1733
Elongation per inch under strain at elastic limit	do...	.001933
Reduction in diameter at point of rupture	do...	.074
Reduction in area after rupture, per centum of original section		24.6
Position of rupture		½ inch from middle of stem
Character of broken surface		granular, radiating from a dull spot at the circumference
Elongation of inch sections		".16, ".20*, ".16

No. 572.

Marks, K E X.
Length, 5″.00.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000150	.000150	0.	.....	
5,000	10,000	.000300	.000150	0.	.....	
7,500	15,000	.000400	.000100	0.	.....	
10,000	20,000	.000550	.000150	0.	.....	
12,500	25,000	.000700	.000150	0.	.....	
15,000	30,000	.000850	.000150	0.	.....	
17,500	35,000	.001000	.000150	0.	.....	
20,000	40,000	.001150	.000150	0.	.....	
22,500	45,000	.001300	.000150	0.	.....	
25,000	50,000	.001500	.000200	.000050	.000050	
25,500	51,000	.001500	0.	.....	.....	
26,000	52,000	.001550	.000050	.....	.....	
26,500	53,000	.001550	0.	.....	.....	
27,000	54,000	.001600	.000050	.....	.....	
27,500	55,000	.001650	.000050	.000050	0.	
28,000	56,000	.001700	.000050	.....	.....	
28,500	57,000	.001700	0.	.....	.....	
29,000	58,000	.001750	.000050	.....	.....	
29,500	59,000	.001750	0.	.....	.....	
30,000	60,000	.001800	.000050	.000050	0.	
30,500	61,000	.001850	.000050	.....	.....	Elastic limit.
31,000	62,000	.001750	.000100	.....	.....	
31,500	63,000	.001900	.000150	.....	.....	
32,000	64,000	.002000	.000100	.....	.....	
32,500	65,000	.003000	.001000	.001000	.000950	
51,050	102,100	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	61,000
Compression per inch under stress at elastic limit	inch..	0.001850
Ultimate strength per square inch of original section	pounds..	102,100
Manner of failure		triple flexure

No. 573.

Marks, L E X.
Length, 5″.00.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000150	.000150	0.	.....	
5,000	10,000	.000300	.000150	0.	.....	
7,500	15,000	.000450	.000150	0.	.....	
10,000	20,000	.000600	.000150	0.	.....	
12,500	25,000	.000750	.000150	0.	.....	
15,000	30,000	.000900	.000150	0.	.....	
17,500	35,000	.001050	.000150	0.	.....	
20,000	40,000	.001200	.000150	0.	.....	
22,500	45,000	.001350	.000150	0.	.....	
25,000	50,000	.001500	.000150	0.	.....	
25,500	51,000	.001500	0.	.....	.....	
26,000	52,000	.001550	.000050	.....	.....	
26,500	53,000	.001600	.000050	.....	.....	
27,000	54,000	.001650	.000050	.....	.....	
27,500	55,000	.001700	.000050	.000050	.000050	
28,000	56,000	.001800	.000100	.....	.....	
28,500	57,000	.001850	.000050	.....	.....	Elastic limit.
29,000	58,000	.002000	.000150	.....	.....	
29,500	59,000	.002050	.000050	.....	.....	
30,000	60,000	.001800	.000250	0.	—.000050	
30,500	61,000	.005350	.003550	.....	.....	
31,000	62,000	.005750	.000400	.....	.....	
31,500	63,000	.006150	.000400	.....	.....	
32,000	64,000	.007100	.000950	.....	.....	
32,500	65,000	.008000	.000900	.005750	.004750	
44,600	89,200	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	57,000
Compression per inch under stress at elastic limit	inch..	0.001850
Ultimate strength per square inch of original section	pounds..	89,200
Manner of failure		triple flexure

No. 572.

Marks, K E X.
Length, 5″.00.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000150	.000150	0.	.....	
5,000	10,000	.000300	.000150	0.	.....	
7,500	15,000	.000400	.000100	0.	.....	
10,000	20,000	.000550	.000150	0.	.....	
12,500	25,000	.000700	.000150	0.	.....	
15,000	30,000	.000850	.000150	0.	.....	
17,500	35,000	.001000	.000150	0.	.....	
20,000	40,000	.001150	.000150	0.	.....	
22,500	45,000	.001300	.000150	0.	.....	
25,000	50,000	.001500	.000200	.000050	.000050	
25,500	51,000	.001500	0.	.....	.....	
26,000	52,000	.001550	.000050	.....	.....	
26,500	53,000	.001550	0.	.....	.....	
27,000	54,000	.001600	.000050	.....	.....	
27,500	55,000	.001650	.000050	.000050	0.	
28,000	56,000	.001700	.000050	.....	.....	
28,500	57,000	.001700	0.	.....	.....	
29,000	58,000	.001750	.000050	.....	.....	
29,500	59,000	.001750	0.	.....	.....	
30,000	60,000	.001800	.000050	.000050	0.	
30,500	61,000	.001850	.000350	.....	.....	Elastic limit.
31,000	62,000	.001750	.000100	.....	.....	
31,500	63,000	.001900	.000150	.....	.....	
32,000	64,000	.002000	.000100	.....	.....	
32,500	65,000	.003000	.001000	.001000	.000950	
51,050	102,100	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	61,000
Compression per inch under stress at elastic limit	inch..	0.001850
Ultimate strength per square inch of original section	pounds..	102,100
Manner of failure		triple flexure

No. 573.

Marks, L E X.
Length, 5″.00.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000150	.000150	0.	.....	
5,000	10,000	.000300	.000150	0.	.....	
7,500	15,000	.000450	.000150	0.	.....	
10,000	20,000	.000600	.000150	0.	.....	
12,500	25,000	.000750	.000150	0.	.....	
15,000	30,000	.000900	.000150	0.	.....	
17,500	35,000	.001050	.000150	0.	.....	
20,000	40,000	.001200	.000150	0.	.....	
22,500	45,000	.001350	.000150	0.	.....	
25,000	50,000	.001500	.000150	0.	.....	
25,500	51,000	.001500	0.	.....	.....	
26,000	52,000	.001550	.000050	.....	.....	
26,500	53,000	.001600	.000050	.....	.....	
27,000	54,000	.001650	.000050	.....	.....	
27,500	55,000	.001700	.000050	.000050	.000050	
28,000	56,000	.001800	.000100	.....	.....	
28,500	57,000	.001850	.000050	.....	.....	Elastic limit.
29,000	58,000	.002000	.000150	.....	.....	
29,500	59,000	.002050	.000050	.....	.....	
30,000	60,000	.001800	.000250	0.	—.000050	
30,500	61,000	.005350	.003550	.....	.....	
31,000	62,000	.005750	.000400	.....	.....	
31,500	63,000	.006150	.000400	.....	.....	
32,000	64,000	.007100	.000950	.....	.....	
32,500	65,000	.008000	.000900	.005750	.004750	
44,600	89,200	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	57,000
Compression per inch under stress at elastic limit	inch..	0.001850
Ultimate strength per square inch of original section	pounds..	89,200
Manner of failure		triple flexure

No. 574.

Marks, N E X.
Length, 3″.94.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000150	.000150	0.	.....	
5,000	10,000	.000300	.000150	0.	.....	
7,500	15,000	.000450	.000150	0.	.....	
10,000	20,000	.000600	.000150	0.	.....	
12,500	25,000	.000750	.000150	0.	.....	
15,000	30,000	.000900	.000150	0.	.....	
17,500	35,000	.001050	.000150	0.	.....	
20,000	40,000	.001200	.000150	.000050	.000050	
22,500	45,000	.001400	.000200	.000050	0.	
25,000	50,000	.001600	.000200	.000100	.000050	
25,500	51,000	.001650	.000050	.....	.....	
26,000	52,000	.001700	.000050	.....	.....	
26,500	53,000	.001750	.000050	.....	.....	Elastic limit.
27,000	54,000	.001850	.000100	.....	.....	
27,500	55,000	.002000 .008000	.000150 .006000	.006050	.005950	
28,000	56,000	.009200	.001200	.....	.....	
28,500	57,000	.009600	.000400	.....	.....	
29,000	58,000	.009950	.000350	.....	.....	
29,500	59,000	.010400	.000450	.....	.....	
30,000	60,000	.010800	.000400	.008700	.002650	
50,800	101,600	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	53,000
Compression per inch under stress at elastic limit	inch..	0.001750
Ultimate strength per square inch of original section	pounds..	101,600
Manner of failure		triple flexure

No. 575.

Marks, P E X.
Length, 3″.94.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000150	.000150	0.	.....	
5,000	10,000	.000300	.000150	0.	.....	
7,500	15,000	.000450	.000150	0.	.....	
10,000	20,000	.000600	.000150	0.	.....	
12,500	25,000	.000750	.000150	0.	.....	
15,000	30,000	.000900	.000150	0.	.....	
17,500	35,000	.001050	.000150	0.	.....	
20,000	40,000	.001200	.000150	0.	.....	
22,500	45,000	.001350	.000150	0.	.....	
25,000	50,000	.001500	.000150	0.	.....	
25,500	51,000	.001500	0.	.....	.....	
26,000	52,000	.001550	.000050	.....	.....	
26,500	53,000	.001550	0.	.....	.....	
27,000	54,000	.001600	.000050	.....	.....	Elastic limit.
		.005800	.004200	.....	.....	
27,500	55,000	.006800	.001000	.004800	.004800	
28,000	56,000	.007600	.000800	.....	.....	
28,500	57,000	.008500	.000900	.....	.....	
29,000	58,000	.009250	.000750	.....	.....	
29,500	59,000	.010300	.001050	.....	.....	
30,000	60,000	.011300	.001000	.008950	.004150	
50,800	101,600	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	54,000
Compression per inch under stress at elastic limit	inch..	0.001600
Ultimate strength per square inch of original section	pounds..	101,600
Manner of failure		triple flexure

No. 1671.

Marks, H E X_1
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000267	.000134	0.	.....	
3,750	15,000	.000433	.000166	0.	.....	
5,000	20,000	.000633	.000200	0.	.....	
6,250	25,000	.000767	.000134	0.	.....	
7,500	30,000	.000900	.000133	0.	.....	
8,750	35,000	.001033	.000133	0.	.....	
10,000	40,000	.001200	.000167	0.	.....	
11,250	45,000	.001333	.000133	0.	.....	
11,500	46,000	.001367	.000034	.....	.....	
11,750	47,000	.001400	.000033	.....	.....	
12,000	48,000	.001467	.000067	.....	.....	
12,250	49,000	.001500	.000033	.....	.....	
12,500	50,000	.001533	.000033	0.	.....	
12,750	51,000	.001567	.000034	.....	.....	
13,000	52,000	.001633	.000066	.....	.....	
13,250	53,000	.001667	.000034	.....	.....	
13,500	54,000	.001700	.000033	.....	.....	
13,750	55,000	.001733	.000033	0.	.....	
14,000	56,000	.001767	.000034	.....	.....	
14,250	57,000	.001833	.000066	.....	.....	Elastic limit.
14,500	58,000	.003500	.001667	.....	.....	
14,750	59,000	.004667	.001167	.....	.....	
15,000	60,000	.005767	.001100	.003567	.003567	
15,500	62,000	.007333	.001566	.....	.....	
16,000	64,000	.009167	.001834	.....	.....	
16,500	66,000	.011000	.001833	.....	.....	
17,000	68,000	.012733	.001733	.....	.....	
17,500	70,000	.014567	.001834	.....	.....	
18,000	72,000	.016500	.001933	.....	.....	
18,500	74,000	.018500	.002000	.....	.....	
19,000	76,000	.020567	.002067	.....	.....	
19,500	78,000	.022733	.002166	.....	.....	
20,000	80,000	.025333	.002600	.....	.....	
20,500	82,000	.028033	.002700	.....	.....	
21,000	84,000	.031500	.003467	.....	.....	
21,500	86,000	.034167	.002667	.....	.....	
22,000	88,000	.037567	.003400	.....	.....	
22,500	90,000	.041667	.004100	.....	.....	
23,000	92,000	.046500	.004833	.....	.....	
23,500	94,000	.052833	.006333	.....	.....	
24,000	96,000	.0600	.007167	.....	.....	
24,500	98,000	.0700	.0100	.....	.....	
25,000	100,000	.1033	.0333	.....	.....	
25,030	100,120	.1267	.0234	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	100,120
Elastic limit per square inch of original section	do...	57,000
Elongation per inch after rupture	inch..	0.2100
Elongation per inch under strain at elastic limit	do...	.001833
Reduction in diameter at point of rupture	do...	.144
Reduction in area after rupture, per centum of original section		44.6
Position of rupture		".95 from neck
Character of broken surface		granular at circumference; dull silky center
Elongation of inch sections		".30*, ".18, ".15

No. 1673.

Marks, H E X$_2$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000267	.000167	0.	.....	
3,750	15,000	.000433	.000166	0.	.....	
5,000	20,000	.000600	.000167	0.	.....	
6,250	25,000	.000767	.000167	0.	.....	
7,500	30,000	.000933	.000166	0.	.....	
8,750	35,000	.001100	.000167	0.	.....	
10,000	40,000	.001267	.000167	0.	.....	
11,250	45,000	.001367	.000100	0.	.....	
12,500	50,000	.001533	.000166	0.	.....	
12,750	51,000	.001567	.000034	.....	.....	
13,000	52,000	.001600	.000033	.....	.....	
13,250	53,000	.001633	.000033	.....	.....	Elastic limit.
13,500	54,000	.001733	.000100	.....	.....	
13,750	55,000	.001900	.000167	.....	.....	
		.013367	.011467	.011233	.011233	
14,000	56,000	.014200	.000833	.....	.....	
14,250	57,000	.014567	.000367	.....	.....	
14,500	58,000	.015633	.001066	.....	.....	
14,750	59,000	.016200	.000567	.....	.....	
15,000	60,000	.017233	.001033	.014700	.003467	
15,500	62,000	.018733	.001500	.....	.....	
16,000	64,000	.020867	.002134	.....	.....	
16,500	66,000	.023333	.002466	.....	.....	
17,000	68,000	.025667	.002334	.....	.....	
17,500	70,000	.028200	.002533	.....	.....	
18,000	72,000	.031000	.002800	.....	.....	
18,500	74,000	.034033	.003033	.....	.....	
19,000	76,000	.037767	.003734	.....	.....	
19,500	78,000	.041500	.003733	.....	.....	
20,000	80,000	.045667	.004167	.....	.....	
20,500	82,000	.0500	.004333	.....	.....	
21,000	84,000	.0567	.0067	.....	.....	
21,500	86,000	.0667	.0100	.....	.....	
22,000	88,000	.0767	.0100	.....	.....	
22,500	90,000	.0900	.0133	.....	.....	
23,000	92,000	.1200	.0300	.....	.....	
23,200	93,040	.1633	.0433	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	* 93,040
Elastic limit per square inch of original section	do...	53,000
Elongation per inch after rupture	inch..	0.3233
Elongation per inch under strain at elastic limit	do...	.001633
Reduction in diameter at point of rupture	do...	.124
Reduction in area after rupture, per centum of original section		39.2
Position of rupture		".85 from neck
Character of broken surface		silky
Elongation of inch sections		".34*, ".17, ".16

No. 1672.

Marks, J E X_1
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000233	.000133	0.	.....	
3,750	15,000	.000333	.000100	0.	.....	
5,000	20,000	.000533	.000200	0.	.....	
6,250	25,000	.000667	.000134	0.	.....	
7,500	30,000	.000833	.000166	0.	.....	
8,750	35,000	.001000	.000167	0.	.....	
10,000	40,000	.001167	.000167	0.	.....	
11,250	45,000	.001300	.000133	0.	.....	
11,500	46,000	.001333	.000033	.....	.....	
11,750	47,000	.001367	.000034	.....	.....	
12,000	48,000	.001400	.000033	.....	.....	
12,250	49,000	.001433	.000033	.....	.....	
12,500	50,000	.001500	.000067	0.	.....	
12,750	51,000	.001533	.000033	.....	.....	
13,000	52,000	.001600	.000067	.....	.....	
13,250	53,000	.001633	.000033	.....	.....	
13,500	54,000	.001667	.000034	.....	.....	
13,750	55,000	.001667	0.	0.	.....	
14,000	56,000	.001700	.000033	.....	.....	
14,250	57,000	.001733	.000033	.....	.....	
14,500	58,000	.001767	.000034	.....	.....	
14,750	59,000	.001800	.000033	.....	.....	
15,000	60,000	.001933	.000133	.000067	.000067	Elastic limit.
15,250	61,000	.002100	.000467	.....	.....	
15,500	62,000	.004067	.001667	.....	.....	
15,750	63,000	.004833	.000766	.....	.....	
16,000	64,000	.006867	.002034	.....	.....	
16,250	65,000	.007333	.000466	.....	.....	
16,500	66,000	.007900	.000567	.....	.....	
17,000	68,000	.009533	.001633	.....	.....	
17,500	70,000	.011700	.002167	.....	.....	
18,000	72,000	.014033	.002333	.....	.....	
18,500	74,000	.015133	.001100	.....	.....	
19,000	76,000	.016767	.001634	.....	.....	
19,500	78,000	.019433	.002666	.....	.....	
20,000	80,000	.020400	.000967	.....	.....	
20,500	82,000	.023333	.002933	.....	.....	
21,000	84,000	.025400	.002067	.....	.....	
21,500	86,000	.027667	.002267	.....	.....	
22,000	88,000	.030700	.003033	.....	.....	
22,500	90,000	.033433	.002733	.....	.....	
23,000	92,000	.037100	.003667	.....	.....	
23,500	94,000	.041000	.003900	.....	.....	
24,000	96,000	.0433	.0023	.....	.....	
24,500	98,000	.0500	.0067	.....	.....	
25,000	100,000	.0567	.0067	.....	.....	
25,500	102,000	.0700	.0133	.....	.....	
26,000	104,000	.0967	.0267	.....	.....	
26,040	104,160	.1233	.0266	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	104,160
Elastic limit per square inch of original section	do...	60,000
Elongation per inch after rupture	inch..	0.1767
Elongation per inch under strain at elastic limit	do...	.001933
Reduction in diameter at point of rupture	do...	.074
Reduction in area after rupture, per centum of original section		24.6
Position of rupture		".45 from neck
Character of broken surface		granular, radiating from dull colored metal at circumference
Diameter		½" from point of rupture, ".46
Elongation of inch sections		".28*, ".15, ".10

No. 1674.

Marks, J E X_2
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000200	.000100	0.	.....	
3,750	15,000	.000367	.000167	0.	.....	
5,000	20,000	.000533	.000166	0.	.....	
6,250	25,000	.000700	.000167	0.	.....	
7,500	30,000	.000867	.000167	0.	.....	
8,750	35,000	.001033	.000166	0.	.....	
10,000	40,000	.001200	.000167	0.	.....	
11,250	45,000	.001333	.000133	.....	.....	
11,500	46,000	.001367	.000034	.....	.....	
11,750	47,000	.001400	.000033	.....	.....	Elastic limit.
12,000	48,000	.003733	.002333	.....	.....	
12,250	49,000	.007167	.003434	.....	.....	
12,500	50,000	.009933	.002766	.007900	.007900	
12,750	51,000	.010533	.000600	.....	.....	
13,000	52,000	.011100	.000567	.....	.....	
13,250	53,000	.011633	.000533	.....	.....	
13,500	54,000	.012933	.001300	.....	.....	
13,750	55,000	.013733	.000800	.011500	.003600	
14,000	56,000	.014433	.000700	.....	.....	
14,250	57,000	.014900	.000467	.....	.....	
14,500	58,000	.015700	.000800	.....	.....	
14,750	59,000	.016667	.000967	.....	.....	
15,000	60,000	.017733	.001066	.015200	.003700	
15,500	62,000	.019333	.001600	.....	.....	
16,000	64,000	.021500	.002167	.....	.....	
16,500	66,000	.023733	.002233	.....	.....	
17,000	68,000	.025833	.002100	.....	.....	
17,500	70,000	.028233	.002400	.....	.....	
18,000	72,000	.031033	.002800	.....	.....	
18,500	74,000	.034000	.002967	.....	.....	
19,000	76,000	.036900	.002900	.....	.....	
19,500	78,000	.040667	.003767	.....	.....	
20,000	80,000	.044667	.004000	.....	.....	
20,500	82,000	.049333	.004666	.....	.....	
21,000	84,000	.054667	.005334	.....	.....	
21,500	86,000	.061333	.006666	.....	.....	
22,000	88,000	.0733	.011967	.....	.....	
22,500	90,000	.0833	.0100	.....	.....	
23,000	92,000	.1000	.0167	.....	.....	
23,290	93,160	.1333	.0333	.....	.....	Tensile strength.

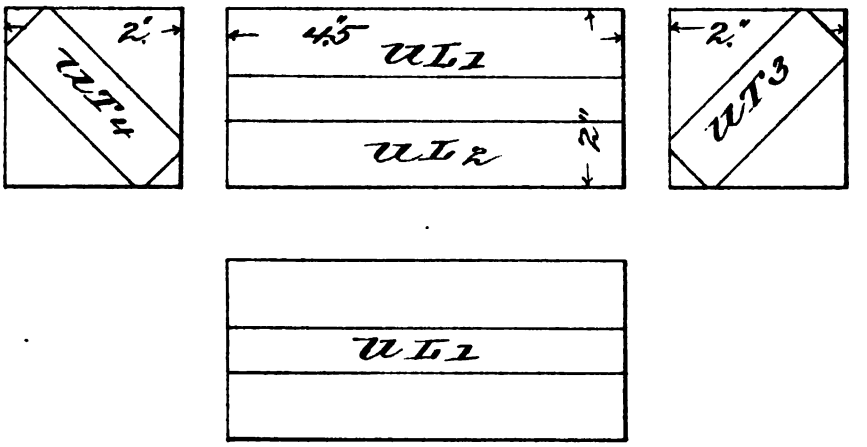
General summary.

Tensile strength per square inch of original section	pounds..	93,160
Elastic limit per square inch of original section	do...	47,000
Elongation per inch after rupture	inch..	0.1767
Elongation per inch under strain at elastic limit	do...	.0014
Reduction in diameter at point of rupture	do...	.124
Reduction in area after rupture, per centum of original section		39.2
Position of rupture		$\frac{1}{2}$" from middle of stem
Character of broken surface		silky, interspersed with granular metal
Elongation of inch sections		".14, ".30*, ".09

TESTS OF STEEL WIRE ".15 SQUARE USED IN GUN CONSTRUCTION.

Top wire billet of ingot No. 1

Lot No. 3



H Ex 31 49 2

TESTS OF STEEL FROM UPPER END OF TOP WIRE BILLET, INGOT No. 1, LOT No 3.

No. 2771.

Marks, $\frac{3\ W.}{U\ L.}$
Diameter, ".504.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.		
2,000	10,000	.000400	.000250	0.		
3,000	15,000	.000600	.000200	0.		
4,000	20,000	.000850	.000250	0.		
5,000	25,000	.001050	.000200	0.		
6,000	30,000	.001250	.000200	0.		
7,000	35,000	.001450	.000200			
8,000	40,000	.001650	.000200			
8,200	41,000	.001650	0.			
8,400	42,000	.001700	.000050			
8,600	43,000	.001750	.000050			Elastic limit.
8,800	44,000	.018000	.016250			
9,000	45,000	.019000	.001000			
9,200	46,000	.019700	.000700			
9,400	47,000	.020650	.000950			
9,600	48,000	.021850	.001200			
9,800	49,000	.023600	.001750			
10,000	50,000	.025250	.001650			
10,400	52,000	.028000	.002750			
10,800	54,000	.031750	.003750			
11,200	56,000	.036500	.004750			
11,600	58,000	.041000	.004500			
12,000	60,000	.046500	.005500			
12,400	62,000	.0525	.0060			
12,800	64,000	.0600	.0075			
13,200	66,000	.0700	.0100			
13,600	68,000	.0850	.0150			
14,000	70,000	.1000	.0150			
14,400	72,000	.1400	.0400			
14,700	73,500	.1950	.0550			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	73,500
Elastic limit per square inch of original section	do...	43,000
Elongation per inch after rupture	inch..	0.3400
Elongation per inch under strain at elastic limit	do...	.00175
Reduction in diameter at point of rupture	do...	.164
Reduction in area after rupture, per centum of original section		54.6
Position of rupture		1".20 from neck
Character of broken surface		fine silky
Elongation of inch sections		".28, ".40

No. 2772.

Marks, $\frac{3\,W_1}{U\,L_2}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000200	.000200	0.	.....	
2,000	10,000	.000400	.000200	0.	.....	
3,000	15,000	.000550	.000150	0.	.....	
4,000	20,000	.000700	.000150	0.	.....	
5,000	25,000	.000850	.000150	0.	.....	
6,000	30,000	.001050	.000200	0.	.....	
7,000	35,000	.001200	.000150	.....	.....	
8,000	40,000	.001400	.000200	.....	.....	
8,200	41,000	.001450	.000050	.....	.....	
8,400	42,000	.001500	.000050	.....	.....	Elastic limit
8,600	43,000	.005300	.003800	.....	.....	
8,800	44,000	.018000	.012700	.....	.....	
9,000	45,000	.019050	.001050	.....	.....	
9,200	46,000	.020000	.000950	.....	.....	
9,400	47,000	.020800	.000800	.....	.....	
9,600	48,000	.022550	.001750	.....	.....	
9,800	49,000	.023900	.001350	.....	.....	
10,000	50,000	.025500	.001600	.....	.....	
10,400	52,000	.028550	.003050	.....	.....	
10,800	54,000	.032350	.003800	.....	.....	
11,200	56,000	.036750	.004400	.....	.....	
11,600	58,000	.041300	.004550	.....	.....	
12,000	60,000	.046550	.005250	.....	.....	
12,400	62,000	.053250	.006700	.....	.....	
12,800	64,000	.060500	.007250	.....	.....	
13,200	66,000	.0700	.0095	.....	.....	
13,600	68,000	.0850	.0150	.....	.....	
14,000	70,000	.1000	.0150	.....	.....	
14,400	72,000	.1250	.0250	.....	.....	
14,760	73,800	.1950	.0700	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	73,800
Elastic limit per square inch of original section	do...	42,000
Elongation per inch after rupture	inch.	0.3400
Elongation per inch under strain at elastic limit	do...	.0015
Reduction in diameter at point of rupture	do...	.165
Reduction in area after rupture, per centum of original section	do...	54.6
Position of rupture		at middle of stem
Character of broken surface		fine silky
Elongation of inch sections		".34*, ".34*

No. 2773.

Marks, $\frac{3\ W}{U\ T}$.
Diameter, $\frac{1}{8}$".320.
Sectional area, .08 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
80	1,000	0.	0.	0.	0.	Initial load.
400	5,000	.0001	.0001			
800	10,000	.0002	.0001			
1,200	15,000	.0003	.0001			
1,600	20,000	.0005	.0002			
2,000	25,000	.0007	.0002			
2,400	30,000	.0009	.0002			
2,800	35,000	.0010	.0001			
2,880	36,000	.0011	.0001			Elastic limit.
2,960	37,000	.0018	.0007			
3,040	38,000	.0030	.0012			
3,120	39,000	.0049	.0019			
3,200	40,000	.0163	.0114			
3,280	41,000	.0172	.0009			
3,360	42,000	.0187	.0015			
3,440	43,000	.0198	.0011			
3,520	44,000	.0215	.0017			
3,600	45,000	.0230	.0015			
3,680	46,000	.0251	.0021			
3,760	47,000	.0270	.0019			
3,840	48,000	.0285	.0015			
3,920	49,000	.0298	.0013			
4,000	50,000	.0317	.0019			
4,160	52,000	.0350	.0033			
4,320	54,000	.0407	.0057			
4,480	56,000	.0470	.0063			
4,640	58,000	.0528	.0058			
4,800	60,000	.0619	.0091			
4,960	62,000	.065	.0031			
5,120	64,000	.075	.010			
5,280	66,000	.09	.015			
5,440	68,000	.11	.020			
5,600	70,000	.145	.035			
5,720	71,500	.225	.080			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	71,500
Elastic limit per square inch of original section	do...	36,000
Elongation per inch after rupture	inch..	0.30
Elongation per inch under strain at elastic limit	do...	.0011
Reduction in diameter at point of rupture	do...	.027
Reduction in area after rupture, per centum of original section		33.7
Position of rupture		".65 from neck
Character of broken surface		silky; serrated

No. 2776.

Marks, $\frac{3}{U}\frac{W_1}{T_4}$
Diameter, $\frac{7}{16}$".320.
Sectional area, .08 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
80	1,000	0.	0.	0.	0.	Initial load.
400	5,000	.0001	.0001	.....	.....	
800	10,000	.0002	.0001	.....	.....	
1,200	15,000	.0003	.0001	.....	.....	
1,600	20,000	.0005	.0002	.....	.....	
2,000	25,000	.0007	.0002	.....	.....	
2,400	30,000	.0009	.0002	.....	.....	
2,800	35,000	.0011	.0002	.....	.....	
2,880	36,000	.0011	0.	.....	.....	
2,960	37,000	.0012	.0001	.....	.....	Elastic limit.
3,040	38,000	.0016	.0004	.....	.....	
3,120	39,000	.0040	.0024	.....	.....	
3,200	40,000	.0160	.0120	.....	.....	
3,280	41,000	.0171	.0011	.....	.....	
3,360	42,000	.0180	.0009	.....	.....	
3,440	43,000	.0195	.0015	.....	.....	
3,520	44,000	.0213	.0018	.....	.....	
3,600	45,000	.0226	.0013	.....	.....	
3,680	46,000	.0245	.0019	.....	.....	
3,760	47,000	.0260	.0015	.....	.....	
3,840	48,000	.0275	.0015	.....	.....	
3,920	49,000	.0294	.0019	.....	.....	
4,000	50,000	.0317	.0023	.....	.....	
4,160	52,000	.0352	.0035	.....	.....	
4,320	54,000	.0404	.0052	.....	.....	
4,480	56,000	.0472	.0068	.....	.....	
4,640	58,000	.0517	.0045	.....	.....	
4,800	60,000	.0610	.0093	.....	.....	
4,960	62,000	.0700	.0090	.....	.....	
5,120	64,000	.0900	.0200	.....	.....	
5,280	66,000	.10	.010	.....	.....	
5,440	68,000	.115	.015	.....	.....	
5,600	70,000	.155	.040	.....	.....	
5,680	71,000	.225	.070	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	71,000
Elastic limit per square inch of original section	do...	37,000
Elongation per inch after rupture	inch..	0.27
Elongation per inch under strain at elastic limit	do...	.0012
Reduction in diameter at point of rupture	do...	.027
Reduction in area after rupture, per centum of original section		33.7
Position of rupture		".65 from neck
Character of broken surface		silky; serrated

".15 *SQUARE STEEL WIRE SPECIMENS FROM TWENTY SELECTED BILLETS.*

[See Report of Chief of Ordnance, U. S. Army, 1885, Appendix 43.]

Square steel wire.

Ends of samples remote from end of coil were bent around an arbor ".30 diameter.

Tensile tests made on section of wire next that used for the bending (coiling) test.

Wires straightened between rolls before testing.

No. 2302.

Mark, I

Sectional area, ".1496 × ".1494 = .02235 square inch.

Gauged length, 10".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
112	5,000	0.	0.	0.	0.	Initial load.
224	10,000	.000220	.000220	.....	.....	
335	15,000	.000360	.000140	.....	.....	
447	20,000	.000580	.000220	.000040	.000040	
559	25,000	.000710	.000130	.....	.....	
671	30,000	.000880	.000170	.....	.....	
782	35,000	.001090	.000210	.....	.....	
894	40,000	.001280	.000190	.000080	.000040	
1,006	45,000	.001480	.000200	.....	.....	
1,118	50,000	.001700	.000220	.....	.....	
1,229	55,000	.001940	.000240	.....	.....	
1,341	60,000	.002140	.000200	.000180	.000100	
1,453	65,000	.002380	.000240	.....	.....	
1,565	70,000	.002610	.000230	.....	.....	
1,676	75,000	.002850	.000240	.....	.....	
1,788	80,000	.003120	.000270	.000320	.000140	
1,900	85,000	.003390	.000270	.....	.....	
2,012	90,000	.003630	.000240	.....	.....	
2,123	95,000	.003930	.000300	.....	.....	
2,235	100,000	.004210	.000280	.000610	.000290	
2,347	105,000	.004580	.000370	.....	.....	
2,459	110,000	.004950	.000370	.....	.....	
2,570	115,000	.005400	.000450	.....	.....	
2,682	120,000	.005850	.000450	.001280	.000670	
2,794	125,000	.006250	.000400	.....	.....	
2,906	130,000	.006820	.000570	.....	.....	
3,017	135,000	.007500	.000680	.....	.....	
3,129	140,000	.008280	.000780	.002750	.001470	
3,241	145,000	.009150	.000870	.....	.....	
3,353	150,000	.010250	.001100	.....	.....	
3,595	160,850	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	160,850
Elongation per inch after rupture	inch..	.009
Dimensions at point of rupture		".137 × ".137
Reduction in area after rupture, per centum of original section		16.0
Position of rupture		5½" outside the ganged length
Character of broken surface		fine silky

No. 2303.

Mark, II.
Sectional area, ″.1488×″.1492=.0222 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
111	5,000	0.	0.	0.	0.	Initial load.
222	10,000	.000220	.000220	.....	.....	
333	15,000	.000400	.000180	.....	.....	
444	20,000	.000590	.000190	.000020	.000020	
555	25,000	.000790	.000200	.....	.....	
666	30,000	.001000	.000210	.....	.....	
777	35,000	.001200	.000200	.....	.....	
888	40,000	.001420	.000220	.000100	.000080	
999	45,000	.001620	.000200	.....	.....	
1,110	50,000	.001830	.000210	.....	.....	
1,221	55,000	.002040	.000210	.....	.....	
1,332	60,000	.002250	.000210	.000180	.000080	
1,443	65,000	.002480	.000230	.....	.....	
1,554	70,000	.002710	.000230	.....	.....	
1,665	75,000	.002980	.000270	.....	.....	
1,776	80,000	.003210	.000230	.000260	.000180	
1,887	85,000	.003480	.000270	.....	.....	
1,998	90,000	.003730	.000250	.....	.....	
2,109	95,000	.004050	.000320	.....	.....	
2,220	100,000	.004400	.000350	.000720	.000460	
2,331	105,000	.004700	.000300	.....	.....	
2,442	110,000	.005050	.000350	.....	.....	
2,553	115,000	.005480	.000430	.....	.....	
2,664	120,000	.005920	.000440	.001400	.000680	
2,775	125,000	.006440	.000520	.....	.....	
2,886	130,000	.007030	.000590	.....	.....	
2,997	135,000	.007700	.000670	.....	.....	
3,108	140,000	.008600	.000900	.....	.....	
3,219	145,000	.009610	.001010	.....	.....	
3,330	150,000	.010840	.001230	.....	.....	
3,441	155,000	.013000	.002160	.....	.....	
3,592	161,800	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	161,800
Elongation per inch after rupture	inch..	.009
Dimensions at point of rupture	do...	″.130×″.130
Reduction in area after rupture, per centum of original section		23.9
Position of rupture		3″.8 outside the gauged length
Character of broken surface		fine silky

No. 2304.

Mark, III.
Sectional area, ".1488×".1492=.0222 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
111	5,000	0.	0.	0.	0.	Initial load.
222	10,000	.000160	.000160	.....	.....	
333	15,000	.000350	.000190	.....	.....	
444	20,000	.000540	.000190	—.000010	—.000010	
555	25,000	.000740	.000200	.....	.....	
666	30,000	.001040	.000300	.....	.....	
777	35,000	.001240	.000200	.....	.....	
888	40,000	.001440	.000200	.000040	.000050	
999	45,000	.001640	.000200	.....	.....	
1,110	50,000	.001840	.000200	.....	.....	
1,221	55,000	.002050	.000210	.....	.....	
1,332	60,000	.002260	.000210	.000110	.000070	
1,443	65,000	.002390	.000130	.....	.....	
1,554	70,000	.002600	.000210	.....	.....	
1,665	75,000	.002760	.000160	.....	.....	
1,776	80,000	.003060	.000300	.000200	.000180	
1,887	85,000	.003320	.000260	.....	.....	
1,998	90,000	.003600	.000280	.....	.....	
2,109	95,000	.003910	.000310	.....	.....	
2,220	100,000	.004210	.000300	.000570	.000280	
2,331	105,000	.004600	.000390	.....	.....	
2,442	110,000	.005000	.000400	.....	.....	
2,553	115,000	.005380	.000380	.....	.....	
2,664	120,000	.005810	.000430	.001260	.000690	
2,775	125,000	.006310	.000500	.....	.....	
2,886	130,000	.006940	.000630	.....	.....	
2,997	135,000	.007690	.000750	.....	.....	
3,108	140,000	.008450	.000760	.002880	.001620	
3,219	145,000	.009430	.000980	.....	.....	
3,330	150,000	.010700	.001270	.....	.....	
3,441	155,000	.013380	.002680	.....	.....	
3,546	159,730	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	159,730
Elongation per inch after rupture	inch..	.006
Dimensions at point of rupture		".132×".132
Reduction in area after rupture, per centum of original section		21.5
Position of rupture		.5".6 outside the ganged length
Character of broken surface		fine silky

No. 2303.

Mark, II.
Sectional area, ".1488×".1492=.0222 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
111	5,000	0.	0.	0.	0.	Initial load.
222	10,000	.000220	.000220	.....	.....	
333	15,000	.000400	.000180	.....	.....	
444	20,000	.000590	.000190	.000020	.000020	
555	25,000	.000790	.000200	.....	.....	
666	30,000	.001000	.000210	.....	.....	
777	35,000	.001200	.000200	.....	.....	
888	40,000	.001420	.000220	.000100	.000080	
999	45,000	.001620	.000200	.....	.....	
1,110	50,000	.001830	.000210	.....	.....	
1,221	55,000	.002040	.000210	.....	.....	
1,332	60,000	.002250	.000210	.000180	.000080	
1,443	65,000	.002480	.000230	.....	.....	
1,554	70,000	.002710	.000230	.....	.....	
1,665	75,000	.002980	.000270	.....	.....	
1,776	80,000	.003210	.000230	.000260	.000180	
1,887	85,000	.003480	.000270	.....	.....	
1,998	90,000	.003730	.000250	.....	.....	
2,109	95,000	.004050	.000320	.....	.....	
2,220	100,000	.004400	.000350	.000720	.000460	
2,331	105,000	.004700	.000300	.....	.....	
2,442	110,000	.005050	.000350	.....	.....	
2,553	115,000	.005480	.000430	.....	.....	
2,664	120,000	.005920	.000440	.001400	.000680	
2,775	125,000	.006440	.000520	.....	.....	
2,886	130,000	.007030	.000590	.....	.....	
2,997	135,000	.007700	.000670	.....	.....	
3,108	140,000	.008600	.000900	.....	.....	
3,219	145,000	.009610	.001010	.....	.....	
3,330	150,000	.010840	.001230	.....	.....	
3,441	155,000	.013000	.002160	.....	.....	
3,592	161,800	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	161,800
Elongation per inch after rupture	inch..	.009
Dimensions at point of rupture	do...	".130×".130
Reduction in area after rupture, per centum of original section		23.9
Position of rupture		3".8 outside the gauged length
Character of broken surface		fine silky

No. 2304.

Mark, III.
Sectional area, ″.1488×″.1492=.0222 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
111	5,000	0.	0.	0.	0.	Initial load.
222	10,000	.000160	.000160	.....	.....	
333	15,000	.000350	.000190	.....	.....	
444	20,000	.000540	.000190	—.000010	—.000010	
555	25,000	.000740	.000200	.....	.....	
666	30,000	.001040	.000300	.....	.....	
777	35,000	.001240	.000200	.....	.....	
888	40,000	.001440	.000200	.000040	.000050	
999	45,000	.001640	.000200	.....	.....	
1,110	50,000	.001840	.000200	.....	.....	
1,221	55,000	.002050	.000210	.....	.....	
1,332	60,000	.002260	.000210	.000110	.000070	
1,443	65,000	.002390	.000130	.....	.....	
1,554	70,000	.002600	.000210	.....	.....	
1,665	75,000	.002760	.000160	.....	.....	
1,776	80,000	.003060	.000330	.000290	.000180	
1,887	85,000	.003320	.000230	.....	.....	
1,998	90,000	.003600	.000280	.....	.....	
2,109	95,000	.003910	.000310	.....	.....	
2,220	100,000	.004210	.000300	.000570	.000280	
2,331	105,000	.004600	.000390	.....	.....	
2,442	110,000	.005000	.000400	.....	.....	
2,553	115,000	.005380	.000380	.....	.....	
2,664	120,000	.005810	.000430	.001260	.000690	
2,775	125,000	.006310	.000500	.....	.....	
2,886	130,000	.006940	.000630	.....	.....	
2,997	135,000	.007690	.000750	.....	.....	
3,108	140,000	.008450	.000760	.002880	.001620	
3,219	145,000	.009430	.000980	.....	.....	
3,330	150,000	.010700	.001270	.....	.....	
3,441	155,000	.013380	.002680	.....	.....	
3,546	159,730	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	159,730
Elongation per inch after rupture	inch..	.006
Dimensions at point of rupture		″.132×″.132
Reduction in area after rupture, per centum of original section		21.5
Position of rupture		5″.6 outside the gauged length
Character of broken surface		fine silky

No. 2305.

Mark, IV.
Sectional area, ".1499×".1498=.02245 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
112	5,000	0.	0.	0.	0.	Initial load.
224	10,000	.000200	.000200			
337	15,000	.000380	.000180			
449	20,000	.000570	.000190	.000030	.000030	
561	25,000	.000770	.000200			
673	30,000	.000970	.000200			
786	35,000	.001170	.000200			
898	40,000	.001370	.000200	.000080	.000050	
1,010	45,000	.001570	.000200			
1,122	50,000	.001770	.000200			
1,235	55,000	.001970	.000200			
1,347	60,000	.002180	.000210	.000170	.000090	
1,459	65,000	.002420	.000240			
1,571	70,000	.002650	.000230			
1,684	75,000	.002860	.000210			
1,796	80,000	.003120	.000260	.000340	.000170	
1,908	85,000	.003350	.000230			
2,020	90,000	.003630	.000280			
2,133	95,000	.003930	.000300			
2,245	100,000	.004240	.000310	.000640	.000300	
2,357	105,000	.004540	.000300			
2,470	110,000	.004860	.000320			
2,582	115,000	.005290	.000430			
2,694	120,000	.005760	.000470	.001270	.000630	
2,806	125,000	.006180	.000420			
2,919	130,000	.006730	.000550			
3,031	135,000	.007380	.000650			
3,143	140,000	.008220	.000840	.002780	.001510	
3,255	145,000	.009020	.000800			
3,368	150,000	.010230	.001210			
3,480	155,000	.011860	.001630			
3,735	166,370					Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	166,370
Elongation per inch after rupture	inch..	.015
Dimensions at point of rupture		".133×".133
Reduction in area after rupture, per centum of original section		21.2
Position of rupture		1¼" outside the gauged length
Character of broken surface		fine silky

No. 2306.

Mark, V.
Sectional area, ″.1504 × ″.1505 = .0226 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
113	5,000	0.	0.	0.	0.	Initial load.
226	10,000	.000160	.000160			
339	15,000	.000360	.000200			
452	20,000	.000550	.000190	0.		
565	25,000	.000730	.000180			
678	30,000	.000890	.000160			
791	35,000	.001090	.000200			
904	40,000	.001290	.000200	0.		
1,017	45,000	.001490	.000200			
1,130	50,000	.001690	.000200			
1,243	55,000	.001890	.000200			
1,356	60,000	.002100	.000210	.000100	.000100	
1,469	65,000	.002310	.000240			
1,583	70,000	.002570	.000230			
1,695	75,000	.002820	.000250			
1,808	80,000	.003070	.000250	.000260	.000160	
1,921	85,000	.003290	.000220			
2,034	90,000	.003560	.000270			
2,147	95,000	.003840	.000280			
2,260	100,000	.004140	.000300	.000560	.000300	
2,373	105,000	.004410	.000270			
2,486	110,000	.004770	.000360			
2,599	115,000	.005210	.000440			
2,712	120,000	.005660	.000450	.001160	.000600	
2,825	125,000	.006150	.000490			
2,938	130,000	.006650	.000500			
3,051	135,000	.007320	.000670			
3,164	140,000	.007970	.000650	.002540	.001380	
3,277	145,000	.008790	.000820			
3,390	150,000	.009790	.001000			
3,503	155,000	.011110	.001320			
3,858	170,710					Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	170,710
Elongation of inch sections	inch..	.013
Dimensions at point of rupture		″.142 × ″.142
Reduction in area after rupture, per centum of original section		10.8
Position of rupture		⅝″ outside the gauged length
Character of broken surface		fine silky

No. 2307.

Mark, VI.
Sectional area, ″.1488×″.1496=.02226 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
111	5,000	0.	0.	0.	0.	Initial load.
223	10,000	.000160	.000160			
334	15,000	.000360	.000200			
445	20,000	.000540	.000180	0.		
557	25,000	.000740	.000200			
668	30,000	.000940	.000200			
779	35,000	.001130	.000190			
890	40,000	.001310	.000210	.000060	.000060	
1,002	45,000	.001550	.000210			
1,113	50,000	.001750	.000200			
1,224	55,000	.001950	.000200			
1,336	60,000	.002190	.000240	.000140	.000080	
1,447	65,000	.002430	.000240			
1,558	70,000	.002660	.000230			
1,670	75,000	.002950	.000290			
1,781	80,000	.003190	.000240	.000360	.000220	
1,892	85,000	.003470	.000280			
2,003	90,000	.003780	.000310			
2,115	95,000	.004120	.000340			
2,226	100,000	.004470	.000350	.000820	.000460	
2,337	105,000	.004920	.000450			
2,449	110,000	.005400	.000480			
2,560	115,000	.005920	.000520			
2,671	120,000	.006540	.000620	.001940	.001120	
2,783	125,000	.007200	.000660			
2,894	130,000	.007850	.000650			
3,005	135,000	.008830	.000980			
3,116	140,000	.010140	.001310	.004500	.002560	
3,228	145,000	.011700	.001560			
3,499	157,190					Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	157,190
Elongation per inch after rupture	inch..	.014
Dimensions at point of rupture		″.127×″.127
Reduction in area after rupture, per centum of original section		27.5
Position of rupture		6½″ outside the gauged length
Character of broken surface		fine silky

No. 2308.

Mark, VII.
Sectional area, ".1482×".1487=.02207 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
110	5,000	0.	0.	0.	0.	Initial load.
221	10,000	.000150	.000150	.....	.....	
331	15,000	.000360	.000210	.....	.....	
441	20,000	.000530	.000170	—.000010	—.000010	
552	25,000	.000710	.000180	.....	.....	
662	30,000	.000910	.000200	.....	.....	
772	35,000	.001110	.000200	.....	.....	
882	40,000	.001310	.000200	.000020	.000030	
993	45,000	.001510	.000200	.....	.....	
1,104	50,000	.001710	.000200	.....	.....	
1,214	55,000	.001910	.000200	.....	.....	
1,324	60,000	.002150	.000240	.000090	.000070	
1,434	65,000	.002320	.000170	.....	.....	
1,545	70,000	.002590	.000270	.....	.....	
1,655	75,000	.002846	.000290	.....	.....	
1,766	80,000	.003086	.000240	.000230	.000140	
1,876	85,000	.003350	.000270	.....	.....	
1,986	90,000	.003650	.000300	.....	.....	
2,097	95,000	.003970	.000320	.....	.....	
2,207	100,000	.004290	.000320	.000660	.000430	
2,317	105,000	.004650	.000360	.....	.....	
2,428	110,000	.005050	.000400	.....	.....	
2,538	115,000	.005470	.000420	.....	.....	
2,648	120,000	.005950	.000480	.001450	.000790	
2,759	125,000	.006470	.000520	.....	.....	
2,869	130,000	.007010	.000540	.....	.....	
2,979	135,000	.007710	.000700	.....	.....	
3,090	140,000	.008520	.000810	.003030	.001580	
3,200	145,000	.009410	.000890	.....	.....	
3,311	150,000	.010400	.000990	.....	.....	
3,380	153,150	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section.....pounds.. 153,150
Elongation per inch after rupture.....inch.. .004
Dimensions at point of rupture.....".147×".147
Reduction in area after rupture, per centum of original section..... 2.1
Position of rupture.....2½" outside the gauged length
Character of broken surface.....fine silky for the sound metal
Fractured at a defective spot in the corner of the wire.

No. 2309.

Mark, VIII.
Sectional area, .″1490×.″1496=.02229 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
111	5,000	0.	0.	0.	0.	Initial load.
223	10,000	.000150	.000150	.....	.....	
334	15,000	.000350	.000200	.....	.....	
446	20,000	.000540	.000190	0.	.....	
557	25,000	.000730	.000190	.....	.....	
669	30,000	.000930	.000200	.....	.....	
780	35,000	.001130	.000200	.....	.....	
892	40,000	.001330	.000200	0.	.....	
1,003	45,000	.001530	.000200	.....	.....	
1,115	50,000	.001740	.000210	.....	.....	
1,226	55,000	.001940	.000200	.....	.....	
1,337	60,000	.002150	.000210	.000040	.000040	
1,449	65,000	.002400	.000250	.....	.....	
1,560	70,000	.002630	.000230	.....	.....	
1,672	75,000	.002860	.000230	.....	.....	
1,783	80,000	.003120	.000260	.000240	.000200	
1,895	85,000	.003410	.000290	.....	.....	
2,006	90,000	.003700	.000290	.....	.....	
2,118	95,000	.004000	.000300	.....	.....	
2,229	100,000	.004370	.000370	.000610	.000370	
2,340	105,000	.004620	.000250	.....	.....	
2,452	110,000	.005090	.000470	.....	.....	
2,563	115,000	.005630	.000540	.....	.....	
2,675	120,000	.006180	.000550	.001570	.000960	
2,786	125,000	.006770	.000590	.....	.....	
2,898	130,000	.007540	.000770	.....	.....	
3,009	135,000	.008470	.000930	.....	.....	
3,120	140,000	.010050	.001580	.004400	.002830	
3,232	145,000	.011700	.001650	.....	.....	
3,308	148,410	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section.....pounds.. 148,410
Elongation per inch after rupture.....inch.. .006
Dimensions at point of rupture.....″.126×″.126
Reduction in area after rupture, per centum of original section..... 28.8
Position of rupture.....4¼″ outside the gauged length
Character of broken surface.....fine silky

No. 2310.

Mark, IX.
Sectional area, ".1493×".1493=.02229 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
111	5,000	0.	0.	0.	0.	Initial load.
223	10,000	.000200	.000200	.....	.....	
334	15,000	.000400	.000200	.....	.....	
446	20,000	.000600	.000200	0.	.....	
557	25,000	.000800	.000200	.....	.....	
669	30,000	.001000	.000200	.....	.....	
780	35,000	.001200	.000200	.....	.....	
891	40,000	.001400	.000200	.000020	.000020	
1,003	45,000	.001610	.000210	.....	.....	
1,115	50,000	.001810	.000200	.....	.....	
1,226	55,000	.002030	.000220	.....	.....	
1,337	60,000	.002220	.000200	.000100	.000080	
1,449	65,000	.002480	.000250	.....	.....	
1,560	70,000	.002680	.000200	.....	.....	
1,672	75,000	.002930	.000250	.....	.....	
1,783	80,000	.003180	.000250	.000290	.000190	
1,895	85,000	.003430	.000250	.....	.....	
2,006	90,000	.003720	.000290	.....	.....	
2,118	95,000	.004020	.000300	.....	.....	
2,229	100,000	.004350	.000330	.000690	.000400	
2,340	105,000	.004670	.000320	.....	.....	
2,452	110,000	.005030	.000360	.....	.....	
2,563	115,000	.005450	.000420	.....	.....	
2,675	120,000	.005870	.000420	.001410	.000720	
2,786	125,000	.006400	.000530	.....	.....	
2,898	130,000	.006940	.000540	.....	.....	
3,009	135,000	.007570	.000630	.....	.....	
3,120	140,000	.008300	.000730	.002820	.001410	
3,232	145,000	.009170	.000870	.....	.....	
3,344	150,000	.010210	.001040	.....	.....	
3,715	166,670	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section ..... pounds..	166,670
Elongation per inch after rupture ..... inch...	.026
Dimensions at point of rupture	".136×".136
Reduction in area after rupture, per centum of original section	17.0
Position of rupture	2" from middle of gauged length
Character of broken surface	fine silky

No. 2311.

Mark, X.
Sectional area, ".1490×".1491=.02222 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
111	5,000	0.	0.	0.	0.	Initial load.
222	10,000	.000200	.000200	.....	.....	
333	15,000	.000400	.000200	.....	.....	
444	20,000	.000600	.000200	0.	.....	
556	25,000	.000800	.000200	.....	.....	
667	30,000	.000990	.000190	.....	.....	
778	35,000	.001180	.000190	.....	.....	
889	40,000	.001370	.000190	0.	.....	
1,000	45,000	.001530	.000160	.....	.....	
1,111	50,000	.001730	.000200	.....	.....	
1,222	55,000	.001970	.000240	.....	.....	
1,333	60,000	.002200	.000230	.000110	.000110	
1,444	65,000	.002410	.000210	.....	.....	
1,556	70,000	.002670	.000260	.....	.....	
1,667	75,000	.002950	.000280	.....	.....	
1,778	80,000	.003220	.000270	.000350	.000240	
1,889	85,000	.003510	.000290	.....	.....	
2,000	90,000	.003829	.000319	.....	.....	
2,111	95,000	.004189	.000360	.....	.....	
2,223	100,000	.004609	.000420	.000900	.000550	
2,333	105,000	.004999	.000390	.....	.....	
2,444	110,000	.005519	.000520	.....	.....	
2,556	115,000	.006039	.000520	.....	.....	
2,667	120,000	.006719	.000680	.002040	.001140	
2,778	125,000	.007369	.000650	.....	.....	
2,889	130,000	.008169	.000800	.....	.....	
3,000	135,000	.009219	.001050	.....	.....	
3,111	140,000	.010569	.001360	.....	.....	
3,210	144,460	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	144,460
Elongation per inch after rupture	inch..	.005
Dimensions at point of rupture		".129×".125
Reduction in area after rupture, per centum of original section		27.4
Position of rupture		7" outside the gauged length
Character of broken surface		fine silky

No. 2312.

Mark, XI.
Sectional area, ″.1486×″.1496=.02223 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
111	5,000	0.	0.	0.	0.	Initial load.
222	10,000	.000180	.000180	.....	.....	
333	15,000	.000360	.000280	.....	.....	
445	20,000	.000540	.000180	0.	.....	
556	25,000	.000740	.000180	.....	.....	
667	30,000	.000900	.000160	.....	.....	
778	35,000	.001100	.000200	.....	.....	
889	40,000	.001300	.000200	0.	.....	
1,000	45,000	.001450	.000150	.....	.....	
1,112	50,000	.001620	.000170	.....	.....	
1,223	55,000	.001820	.000200	.....	.....	
1,334	60,000	.002020	.000200	.000030	.000030	
1,445	65,000	.002260	.000240	.....	.....	
1,556	70,000	.002480	.000220	.....	.....	
1,667	75,000	.002700	.000220	.....	.....	
1,778	80,000	.002950	.000250	.000170	.000140	
1,890	85,000	.003100	.000150	.....	.....	
2,001	90,000	.003430	.000330	.....	.....	
2,112	95,000	.003720	.000290	.....	.....	
2,223	100,000	.004020	.000300	.000480	.000310	
2,334	105,000	.004320	.000300	.....	.....	
2,445	110,000	.004630	.000310	.....	.....	
2,556	115,000	.005020	.000390	.....	.....	
2,668	120,000	.005420	.000400	.001020	.000540	
2,779	125,000	.005830	.000410	.....	.....	
2,890	130,000	.006270	.000440	.....	.....	
3,001	135,000	.006790	.000520	.....	.....	
3,112	140,000	.007350	.000560	.001910	.000890	
3,223	145,000	.007980	.000630	.....	.....	
3,335	150,000	.008610	.000630	.....	.....	
3,910	175,890	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	175,890
Elongation per inch after rupture	inch..	.008
Dimensions at point of rupture	do...	″.136×″.141
Reduction in area after rupture, per centum of original section		13.7
Position of rupture		5″ outside the gauged length
Character of broken surface		fine silky

No. 2313.

Mark, XII.
Sectional area, ".1496×".1496=.02238 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
112	5,000	0.	0.	0.	0.	Initial load.
224	10,000	.000220	.000220	.....	.....	
336	15,000	.000400	.000180	.....	.....	
448	20,000	.000590	.000190	—.000030	—.000030	
560	25,000	.000790	.000200	.....	.....	
671	30,000	.000960	.000170	.....	.....	
783	35,000	.001160	.000200	.....	.....	
895	40,000	.001360	.000200	.000040	.000070	
1,007	45,000	.001550	.000190	.....	.....	
1,119	50,000	.001750	.000200	.....	.....	
1,231	55,000	.001960	.000210	.....	.....	
1,343	60,000	.002170	.000210	.000120	.000080	
1,455	65,000	.002410	.000240	.....	.....	
1,567	70,000	.002640	.000230	.....	.....	
1,679	75,000	.002890	.000250	.....	.....	
1,790	80,000	.003140	.000250	.000310	.000190	
1,902	85,000	.003450	.000310	.....	.....	
2,014	90,000	.003680	.000230	.....	.....	
2,126	95,000	.003950	.000270	.....	.....	
2,238	100,000	.004340	.000390	.000710	.000400	
2,350	105,000	.004690	.000350	.....	.....	
2,462	110,000	.005060	.000370	.....	.....	
2,574	115,000	.005460	.000400	.....	.....	
2,686	120,000	.005970	.000510	.001470	.000760	
2,798	125,000	.006510	.000540	.....	.....	
2,909	130,000	.007080	.000570	.....	.....	
3,021	135,000	.007650	.000570	.....	.....	
3,133	140,000	.008580	.000930	.003110	.001640	
3,245	145,000	.009500	.000920	.....	.....	
3,357	150,000	.010380	.000880	.....	.....	
3,670	163,990	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	163,990
Elongation per inch after rupture	inch..	.008
Dimensions at point of rupture		".133×".133
Reduction in area after rupture, per centum of original section		20.9
Position of rupture		5" outside the gauged length
Character of broken surface		fine silky

No. 2314.

Mark, XIII.
Sectional area, ″.1495×″.1492=.02235 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
112	5,000	0.	0.	0.	0.	Initial load.
224	10,000	.000200	.000200	.....	.....	
335	15,000	.000400	.000200	.....	.....	
447	20,000	.000590	.000190	0.	.....	
559	25,000	.000710	.000120	.....	.....	
671	30,000	.000930	.000220	.....	.....	
782	35,000	.001130	.000200	.....	.....	
894	40,000	.001330	.000200	.000030	.000030	
1,006	45,000	.001560	.000230	.....	.....	
1,118	50,000	.001730	.000170	.....	.....	
1,229	55,000	.001930	.000200	.....	.....	
1,341	60,000	.002200	.000270	.000130	.000100	
1,453	65,000	.002400	.000200	.....	.....	
1,565	70,000	.002630	.000230	.....	.....	
1,676	75,000	.002860	.000230	.....	.....	
1,788	80,000	.003150	.000290	.000250	.000120	
1,900	85,000	.003370	.000220	.....	.....	
2,012	90,000	.003670	.000300	.....	.....	
2,123	95,000	.004070	.000400	.....	.....	
2,235	100,000	.004380	.000310	.000690	.000440	
2,347	105,000	.004730	.000350	.....	.....	
2,459	110,000	.005140	.000410	.....	.....	
2,570	115,000	.005590	.000450	.....	.....	
2,682	120,000	.006080	.000490	.001530	.000840	
2,794	125,000	.006640	.000560	.....	.....	
2,906	130,000	.007230	.000590	.....	.....	
3,017	135,000	.008000	.000770	.....	.....	
3,129	140,000	.008780	.000780	.003190	.001660	
3,241	145,000	.009720	.000940	.....	.....	
3,353	150,000	.010970	.001250	.....	.....	
3,735	167,130	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	167,130
Elongation per inch after rupture	inch..	.024
Dimensions at point of rupture		″.137×″.137
Reduction in area after rupture, per centum of original section		16.0
Position of rupture		2″ inside the gauged length
Character of broken surface		fine silky

No. 2315.

Mark, XIV.
Sectional area, ".1494×".1494=.02232 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
112	5,000	0.	0.	0.	0.	Initial load.
223	10,000	.000210	.000210	.....	.....	
335	15,000	.000410	.000200	.....	.....	
446	20,000	.000570	.000160	.000030	.000030	
558	25,000	.000770	.000200	.....	.....	
669	30,000	.000960	.000190	.....	.....	
781	35,000	.001160	.000200	.....	.....	
893	40,000	.001340	.000180	.000050	.000020	
1,004	45,000	.001560	.000220	.....	.....	
1,116	50,000	.001740	.000180	.....	.....	
1,228	55,000	.001970	.000230	.....	.....	
1,339	60,000	.002170	.000200	.000110	.000060	
1,451	65,000	.002400	.000230	.....	.....	
1,562	70,000	.002620	.000220	.....	.....	
1,674	75,000	.002860	.000240	.....	.....	
1,786	80,000	.003120	.000260	.000280	.000170	
1,897	85,000	.003420	.000300	.....	.....	
2,009	90,000	.003660	.000240	.....	.....	
2,120	95,000	.003970	.000310	.....	.....	
2,232	100,000	.004320	.000350	.000690	.000410	
2,344	105,000	.004670	.000350	.....	.....	
2,455	110,000	.005030	.000360	.....	.....	
2,567	115,000	.005480	.000450	.....	.....	
2,678	120,000	.005990	.000510	.001460	.000770	
2,790	125,000	.006530	.000540	.....	.....	
2,902	130,000	.007040	.000510	.....	.....	
3,013	135,000	.007750	.000710	.....	.....	
3,125	140,000	.008680	.000930	.003150	.001690	
3,236	145,000	.009660	.000980	.....	.....	
3,348	150,000	.010900	.001240	.....	.....	
3,540	158,600	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	158,600
Elongation per inch after rupture	inch..	.006
Dimensions at point of rupture		".130×".130
Reduction in area after rupture, per centum of original section		24.3
Position of rupture		5½" outside the gauged section
Character of broken surface		fine silky

No. 2316.

Mark, XV.
Sectional area, ".1490×".1490=.02229 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
111	5,000	0.	0.	0.	0.	Initial load.
223	10,000	.000200	.000200	.....	.....	
334	15,000	.000370	.000170	.....	.....	
446	20,000	.000550	.000180	0.	.....	
557	25,000	.000730	.000180	.....	.....	
669	30,000	.000930	.000200	.....	.....	
780	35,000	.001029	.000099	.....	.....	
891	40,000	.001329	.000300	.000070	.000070	
1,003	45,000	.001529	.000200	.....	.....	
1,115	50,000	.001729	.000200	.....	.....	
1,226	55,000	.001929	.000200	.....	.....	
1,337	60,000	.002130	.000210	.000130	.000060	
1,449	65,000	.002389	.000259	.....	.....	
1,560	70,000	.002619	.000230	.....	.....	
1,672	75,000	.002879	.000260	.....	.....	
1,783	80,000	.003099	.000220	.000309	.000179	
1,895	85,000	.003339	.000240	.....	.....	
2,006	90,000	.003619	.000280	.....	.....	
2,118	95,000	.003909	.000290	.....	.....	
2,229	100,000	.004219	.000310	.000569	.000260	
2,340	105,000	.004599	.000380	.....	.....	
2,452	110,000	.004969	.000370	.....	.....	
2,563	115,000	.005389	.000420	.....	.....	
2,675	120,000	.005909	.000520	.001409	.000840	
2,786	125,000	.006399	.000490	.....	.....	
2,898	130,000	.006869	.000470	.....	.....	
3,009	135,000	.007609	.000740	.....	.....	
3,120	140,000	.008379	.000770	.002809	.001490	
3,232	145,000	.009269	.000890	.....	.....	
3,344	150,000	.010469	.001200	.....	.....	
3,660	164,200	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	164,200
Elongation per inch after rupture	inch..	.010
Dimensions at point of rupture		".134×".134
Reduction in area after rupture, per centum of original section		19.4
Position of rupture		6⅝" outside the ganged length
Character of broken surface		fine silky

No. 2317.

Mark, XVI.
Sectional area, ".1489×".1492=.02222 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
111	5,000	0.	0.	0.	0.	Initial load.
222	10,000	.000200	.000200	.....	.....	
333	15,000	.000400	.000200	.....	.....	
444	20,000	.000540	.000140	0.	.....	
556	25,000	.000740	.000200	.....	.....	
667	30,000	.000940	.000200	.....	.....	
778	35,000	.001140	.000200	.....	.....	
889	40,000	.001330	.000190	.000010	.000010	
1,000	45,000	.001530	.000200	.....	.....	
1,111	50,000	.001720	.000190	.....	.....	
1,222	55,000	.001920	.000200	.....	.....	
1,333	60,000	.002130	.000210	.000100	.000090	
1,444	65,000	.002350	.000220	.....	.....	
1,556	70,000	.002600	.000250	.....	.....	
1,667	75,000	.002810	.000210	.....	.....	
1,778	80,000	.003120	.000310	.000300	.000200	
1,889	85,000	.003370	.000250	.....	.....	
2,000	90,000	.003640	.000270	.....	.....	
2,111	95,000	.003950	.000310	.....	.....	
2,222	100,000	.004310	.000360	.000640	.000340	
2,333	105,000	.004710	.000400	.....	.....	
2,444	110,000	.005060	.000350	.....	.....	
2,556	115,000	.005500	.000440	.....	.....	
2,667	120,000	.006090	.000590	.001520	.000880	
2,778	125,000	.006600	.000510	.....	.....	
2,889	130,000	.007240	.000640	.....	.....	
3,000	135,000	.008000	.000760	.....	.....	
3,111	140,000	.008900	.000900	.003330	.001810	
3,222	145,000	.010000	.001100	.....	.....	
3,333	150,000	.011220	.001220	.....	.....	
3,505	157,740	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	157,740
Elongation per inch after rupture	inch..	.007
Dimensions at point of rupture		".133×".133
Reduction in area after rupture, per centum of original section		20.4
Position of rupture		5/8" outside the gauged length
Character of broken surface		fine silky

No. 2318.

Mark, XVII.
Sectional area, ".1488×".1488=.02214 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
111	5,000	0.	0.	0.	0.	Initial load.
221	10,000	.000200	.000200			
332	15,000	.000390	.000190			
443	20,000	.000570	.000180	.000010	.000010	
553	25,000	.000770	.000200			
664	30,000	.000950	.000180			
775	35,000	.001150	.000200			
886	40,000	.001350	.000200	.000020	.000010	
996	45,000	.001530	.000180			
1,107	50,000	.001740	.000210			
1,218	55,000	.001940	.000200			
1,328	60,000	.002180	.000240	.000080	.000060	
1,439	65,000	.002380	.000200			
1,550	70,000	.002630	.000250			
1,661	75,000	.002880	.000250			
1,771	80,000	.003130	.000250	.000270	.000190	
1,882	85,000	.003450	.000320			
1,993	90,000	.003740	.000290			
2,103	95,000	.004080	.000340			
2,214	100,000	.004480	.000400	.000770	.000500	
2,325	105,000	.004870	.000390			
2,435	110,000	.005320	.000450			
2,546	115,000	.005860	.000540			
2,657	120,000	.006390	.000530	.001780	.001010	
2,768	125,000	.007040	.000650			
2,878	130,000	.007710	.000670			
2,989	135,000	.008530	.000820			
3,100	140,000	.009450	.000920	.003790	.002010	
3,200	144,530					Tensile strength.

General summary.

Tensile strength per square inch of original section.....pounds.. 144,530
Elongation per inch after rupture.....inch.. .003
Dimensions at point of rupture..... ".147×".147
Reduction in area after rupture, per centum of original section..... 2.4
Position of rupture.....4".8 outside the gauged length
Character of broken surface.....sound metal; fine silky. Fractured at defective spot in wire

No. 2319.

Mark, XVIII.
Sectional area, ″.1492×″.1496=.02232 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
112	5,000	0.	0.	0.	0.	Initial load.
223	10,000	.000200	.000200			
335	15,000	.000380	.000180			
446	20,000	.000580	.000200	0.		
558	25,000	.000760	.000180			
669	30,000	.000920	.000160			
781	35,000	.001130	.000210			
893	40,000	.001330	.000200	.000030	.000030	
1,004	45,000	.001520	.000190			
1,116	50,000	.001720	.000200			
1,228	55,000	.001920	.000200			
1,339	60,000	.002120	.000200	.000070	.000040	
1,451	65,000	.002360	.000240			
1,562	70,000	.002590	.000230			
1,674	75,000	.002820	.000230			
1,786	80,000	.003070	.000250	.000240	.000170	
1,897	85,000	.003350	.000280			
2,009	90,000	.003610	.000260			
2,120	95,000	.003950	.000340			
2,232	100,000	.004310	.000360	.000630	.000390	
2,344	105,000	.004650	.000340			
2,455	110,000	.005040	.000390			
2,567	115,000	.005450	.000410			
2,678	120,000	.005990	.000540	.001450	.000820	
2,790	125,000	.006500	.000510			
2,902	130,000	.007130	.000630			
3,013	135,000	.007920	.000790			
3,125	140,000	.008820	.000900	.003270	.001820	
3,236	145,000	.010000	.001180			
3,348	150,000	.011400	.001400			
3,514	157,440					Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	157,440
Elongation per inch after rupture	inch..	.006
Dimensions at point of rupture		″.182×″.132
Reduction in area after rupture, per centum of original section		21.9
Position of rupture		5″ outside the gauged length
Character of broken surface		fine silky

No. 2320.

Mark, XIX.
Sectional area, ".1494×".1496=.02235 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
112	5,000	0.	0.	0.	0.	Initial load.
224	10,000	.000200	.000200	.....	.....	
335	15,000	.000400	.000200	.....	.....	
447	20,000	.000580	.000180	0.	.....	
559	25,000	.000740	.000160	.....	.....	
671	30,000	.000890	.000150	.....	.....	
782	35,000	.001120	.000230	.....	.....	
894	40,000	.001290	.000170	.000050	.000050	
1,006	45,000	.001500	.000210	.....	.....	
1,118	50,000	.001680	.000180	.....	.....	
1,229	55,000	.001890	.000210	.....	.....	
1,341	60,000	.002090	.000200	.000080	.000030	
1,453	65,000	.002320	.000230	.....	.....	
1,565	70,000	.002530	.000210	.....	.....	
1,676	75,000	.002780	.000250	.....	.....	
1,788	80,000	.003010	.000230	.000230	.000150	
1,900	85,000	.003270	.000260	.....	.....	
2,012	90,000	.003520	.000250	.....	.....	
2,123	95,000	.003830	.000310	.....	.....	
2,235	100,000	.004170	.000340	.000560	.000330	
2,347	105,000	.004540	.000370	.....	.....	
2,459	110,000	.004890	.000350	.....	.....	
2,570	115,000	.005290	.000400	.....	.....	
2,682	120,000	.005650	.000360	.001190	.000630	
2,794	125,000	.006210	.000560	.....	.....	
2,906	130,000	.006760	.000550	.....	.....	
3,017	135,000	.007330	.000570	.....	.....	
3,129	140,000	.008070	.000740	.002620	.001430	
3,241	145,000	.008960	.000890	.....	.....	
3,353	150,000	.010070	.001110	.....	.....	
3,724	166,620	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	166,620
Elongation per inch after rupture	inch..	.025
Dimensions at point of rupture		".133×".133
Reduction in area after rupture, per centum of original section		20.9
Position of rupture		at middle of gauged length
Character of broken surface		fine silky

No. 2321.

Mark, XX.
Sectional area, ".1500×".1500=.0225 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
112	5,000	0.	0.	0.	0.	Initial load.
225	10,000	.000200	.000200	.....	.....	
338	15,000	.000370	.000170	.....	.....	
450	20,000	.000550	.000180	0.	.....	
563	25,000	.000730	.000180	.....	.....	
675	30,000	.000950	.000220	.....	.....	
788	35,000	.001120	.000170	.....	.....	
900	40,000	.001300	.000180	.000070	.000070	
1,013	45,000	.001520	.000220	.....	.....	
1,125	50,000	.001720	.000200	.....	.....	
1,237	55,000	.001960	.000240	.....	.....	
1,350	60,000	.002170	.000210	.000110	.000040	
1,463	65,000	.002400	.000230	.....	.....	
1,575	70,000	.002610	.000210	.....	.....	
1,688	75,000	.002840	.000230	.....	.....	
1,800	80,000	.003100	.000260	.000240	.000130	
1,913	85,000	.003360	.000260	.....	.....	
2,025	90,000	.003640	.000280	.....	.....	
2,138	95,000	.003930	.000290	.....	.....	
2,250	100,000	.004270	.000340	.000620	.000380	
2,363	105,000	.004610	.000340	.....	.....	
2,475	110,000.	.004970	.000360	.....	.....	
2,588	115,000	.005370	.000400	.....	.....	
2,700	120,000	.005870	.000500	.001320	.000700	
2,813	125,000	.006360	.000490	.....	.....	
2,925	130,000	.006820	.000460	.....	.....	
3,038	135,000	.007580	.000760	.....	.....	
3,150	140,000	.008350	.000770	.002870	.001550	
3,263	145,000	.009150	.000800	.....	.....	
3,375	150,000	.010350	.001200	.....	.....	
3,710	164,890	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	164,890
Elongation per inch after rupture	inch..	.008
Dimensions at point of rupture		".134×". 134
Reduction in area after rupture, per centum of original section		20.2
Position of rupture		4" outside the gauged length
Character of broken surface		fine silky

STEEL WIRE ".15 SQUARE, TINNED.

[Has received a light annealing after the fifth draught. Specimens taken from coil in the order of their test numbers.]

No. 1675.

Sectional area, ".1500 × ".1505 = .02257 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
113	5,000	0.	0.	0.	0.	Initial load.
226	10,000	.000120	.000120	.....	.....	
339	15,000	.000310	.000190	.....	.....	
451	20,000	.000460	.000150	—.000030	—.000030	
564	25,000	.000640	.000180	.....	.....	
677	30,000	.000810	.000170	.....	.....	
790	35,000	.001010	.000200	.....	.....	
903	40,000	.001220	.000210	—.000030	0.	
1,016	45,000	.001410	.000190	.....	.....	
1,129	50,000	.001630	.000220	.....	.....	
1,241	55,000	.001840	.000210	.....	.....	
1,354	60,000	.002060	.000220	.000060	.000060	
1,467	65,000	.002300	.000240	.....	.....	
1,580	70,000	.002550	.000250	.....	.....	
1,693	75,000	.002840	.000290	.....	.....	
1,806	80,000	.003110	.000270	.000310	.000250	
1,918	85,000	.003410	.000300	.....	.....	
2,031	90,000	.003780	.000370	.....	.....	
2,144	95,000	.004180	.000400	.....	.....	
2,257	100,000	.004680	.000500	.001010	.000700	
2,370	105,000	.005240	.000560	.....	.....	
2,483	110,000	.005810	.000570	.....	.....	
2,596	115,000	.006710	.000900	.....	.....	
2,708	120,000	.008300	.001590	.003580	.002570	
2,821	125,000	.009940	.001640	.....	.....	
2,934	130,000	.012080	.002140	.....	.....	
2,952	130,790	.0260	.007920	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	130,790
Elongation per inch after rupture	inch..	.023
Dimensions at point of rupture		".121 × ".121
Reduction in area after rupture, per centum of original section		35.1
Character of broken surface		fine silky

No. 1676.

Sectional area, ".1500×".1505=.02257 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
113	5,000	0.	0.	0.	0.	Initial load.
226	10,000	.000200	.000200			
339	15,000	.000310	.000110			
451	20,000	.000500	.000190	0.		
564	25,000	.000680	.000180			
677	30,000	.000880	.000200			
790	35,000	.001060	.000180			
903	40,000	.001220	.000160	.000060	.000060	
1,016	45,000	.001420	.000200			
1,129	50,000	.001630	.000210			
1,241	55,000	.001850	.000220			
1,354	60,000	.002050	.000200	.000200	.000140	
1,467	65,000	.002240	.000190			
1,580	70,000	.002500	.000260			
1,693	75,000	.002770	.000270			
1,806	80,000	.003000	.000230	.000360	.000160	
1,918	85,000	.003260	.000260			
2,031	90,000	.003560	.000280			
2,144	95,000	.003880	.000320			
2,257	100,000	.004230	.000350	.000770	.000410	
2,370	105,000	.004660	.000430			
2,483	110,000	.005110	.000450			
2,596	115,000	.005660	.000550			
2,708	120,000	.006420	.000760	.002000	.001230	
2,821	125,000	.007540	.001120			
2,934	130,000	.009870	.002330			
2,953	130,840	.010570	.000700			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	130,840
Elongation per inch after rupture	inch..	.0035
Dimensions at point of rupture		".116×".116
Reduction in area after rupture, per centum of original section		40.4
Position of rupture		outside the gauged length
Character of broken surface		fine silky

No. 1677.

Sectional area, ″.1500×″.1505=.02257 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
113	5,000	0.	0.	0.	0.	Initial load.
226	10,000	.000170	.000170	.....	.....	
339	15,000	.000340	.000170	.....	.....	
451	20,000	.000510	.000170	0.	.....	
564	25,000	.000670	.000160	.....	.....	
677	30,000	.000860	.000190	.....	.....	
790	35,000	.001050	.000190	.....	.....	
903	40,000	.001250	.000200	.000050	.000050	
1,016	45,000	.001460	.000210	.....	.....	
1,129	50,000	.001670	.000210	.....	.....	
1,241	55,000	.001870	.000200	.....	.....	
1,354	60,000	.002070	.000200	.000130	.000080	
1,467	65,000	.002330	.000260	.....	.....	
1,580	70,000	.002560	.000230	.....	.....	
1,693	75,000	.002830	.000270	.....	.....	
1,806	80,000	.003110	.000280	.000340	.000210	
1,918	85,000	.003360	.000250	.....	.....	
2,031	90,000	.003640	.000280	.....	.....	
2,144	95,000	.003990	.000350	.....	.....	
2,257	100,000	.004350	.000360	.000740	.000400	
2,370	105,000	.004740	.000390	.....	.....	
2,483	110,000	.005220	.000480	.....	.....	
2,596	115,000	.005780	.000560	.....	.....	
2,708	120,000	.006490	.000710	.001920	.001180	
2,821	125,000	.007540	.001050	.....	.....	
2,934	130,000	.009570	.002030	.....	.....	
3,036	134,510	.020000	.010430	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	134,510
Elongation per inch after rupture	inch..	.012
Dimensions at point of rupture		″.125×″.125
Reduction in area after rupture, per centum of original section		30.7
Position of rupture		1″.3 outside the gauged length
Character of broken surface		fine silky

No. 1676.

Sectional area, ".1500×".1505=.02257 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
113	5,000	0.	0.	0.	0.	Initial load.
226	10,000	.000200	.000200			
339	15,000	.000310	.000110			
451	20,000	.000500	.000190	0.		
564	25,000	.000680	.000180			
677	30,000	.000880	.000200			
790	35,000	.001060	.000180			
903	40,000	.001220	.000160	.000060	.000060	
1,016	45,000	.001420	.000200			
1,129	50,000	.001630	.000210			
1,241	55,000	.001850	.000220			
1,354	60,000	.002050	.000200	.000200	.000140	
1,467	65,000	.002240	.000190			
1,580	70,000	.002500	.000260			
1,693	75,000	.002770	.000270			
1,806	80,000	.003000	.000230	.000360	.000100	
1,918	85,000	.003280	.000280			
2,031	90,000	.003560	.000280			
2,144	95,000	.003880	.000320			
2,257	100,000	.004230	.000350	.000770	.000410	
2,370	105,000	.004660	.000430			
2,483	110,000	.005110	.000450			
2,596	115,000	.005660	.000550			
2,708	120,000	.006420	.000760	.002000	.001230	
2,821	125,000	.007540	.001120			
2,934	130,000	.009670	.002130			
2,953	130,840	.010570	.000700			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	130,840
Elongation per inch after rupture	inch..	.0035
Dimensions at point of rupture		".116×".116
Reduction in area after rupture, per centum of original section		40.4
Position of rupture		outside the ganged length
Character of broken surface		fine silky

No. 1677.

Sectional area, ".1500×".1505=.02257 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
113	5,000	0.	0.	0.	0.	Initial load.
226	10,000	.000170	.000170	.....	.....	
339	15,000	.000340	.000170	.....	.....	
451	20,000	.000510	.000170	0.	.....	
564	25,000	.000670	.000160	.....	.....	
677	30,000	.000860	.000190	.....	.....	
790	35,000	.001050	.000190	.....	.....	
903	40,000	.001250	.000200	.000050	.000050	
1,016	45,000	.001460	.000210	.....	.....	
1,129	50,000	.001670	.000210	.....	.....	
1,241	55,000	.001870	.000200	.....	.....	
1,354	60,000	.002070	.000200	.000130	.000080	
1,467	65,000	.002330	.000260	.....	.....	
1,580	70,000	.002560	.000230	.....	.....	
1,693	75,000	.002830	.000270	.....	.....	
1,806	80,000	.003110	.000280	.000340	.000210	
1,918	85,000	.003360	.000250	.....	.....	
2,031	90,000	.003640	.000280	.....	.....	
2,144	95,000	.003990	.000350	.....	.....	
2,257	100,000	.004350	.000360	.000740	.000400	
2,370	105,000	.004740	.000390	.....	.....	
2,483	110,000	.005220	.000480	.....	.....	
2,596	115,000	.005780	.000560	.....	.....	
2,708	120,000	.006490	.000710	.001920	.001180	
2,821	125,000	.007540	.001050	.....	.....	
2,934	130,000	.009570	.002030	.....	.....	
3,036	134,510	.020000	.010430	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	134,510
Elongation per inch after rupture	inch..	.012
Dimensions at point of rupture		".125×".125
Reduction in area after rupture, per centum of original section		30.7
Position of rupture		1".3 outside the ganged length
Character of broken surface		fine silky

No. 1678.

Sectional area, ″.1500×″.1505=.02257 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
113	5,000	0.	0.	0.	0.	Initial load.
226	10,000	.000230	.000230	.....	.....	
339	15,000	.000370	.000140	.....	.....	
451	20,000	.000550	.000180	.000030	.000030	
564	25,000	.000740	.000190	.....	.....	
677	30,000	.000940	.000200	.....	.....	
790	35,000	.001130	.000190	.....	.....	
903	40,000	.001310	.000180	.000060	.000030	
1,016	45,000	.001500	.000190	.....	.....	
1,129	50,000	.001720	.000220	.....	.....	
1,241	55,000	.001930	.000210	.....	.....	
1,354	60,000	.002140	.000210	.000160	.000100	
1,467	65,000	.002350	.000210	.....	.....	
1,580	70,000	.002600	.000250	.....	.....	
1,693	75,000	.002870	.000270	.....	.....	
1,806	80,000	.003170	.000300	.000350	.000190	
1,918	85,000	.003430	.000260	.....	.....	
2,031	90,000	.003720	.000290	.....	.....	
2,144	95,000	.004070	.000350	.....	.....	
2,257	100,000	.004470	.000400	.000820	.000470	
2,370	105,000	.004970	.000500	.....	.....	
2,483	110,000	.005470	.000500	.....	.....	
2,596	115,000	.006230	.000760	.....	.....	
2,708	120,000	.007320	.001090	.002630	.001810	
2,821	125,000	.008960	.001640	.....	.....	
2,890	128,050	.017500	.008540	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	128,050
Elongation per inch after rupture	inch..	.023
Dimensions at point of rupture		″.125×″.125
Reduction in area after rupture, per centum of original section		30.7
Character of broken surface		fine silky

No. 1679.

Sectional area, ″.1500×″.1505=.02257 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
113	5,000	0.	0.	0.	0.	Initial load.
226	10,000	.000170	.000170	.....	.....	
339	15,000	.000340	.000170	.....	.....	
451	20,000	.000500	.000160	—.000020	—.000020	
564	25,000	.000660	.000160	.....	.....	
677	30,000	.000850	.000190	.....	.....	
790	35,000	.001040	.000190	.....	.....	
903	40,000	.001250	.000210	0.	.000020	
1,016	45,000	.001450	.000200	.....	.....	
1,129	50,000	.001650	.000200	.....	.....	
1,241	55,000	.001850	.000200	.....	.....	
1,354	60,000	.002070	.000220	.000120	.000120	
1,467	65,000	.002320	.000250	.....	.....	
1,580	70,000	.002540	.000220	.....	.....	
1,693	75,000	.002800	.000260	.....	.....	
1,806	80,000	.003070	.000270	.000310	.000190	
1,918	85,000	.003320	.000250	.....	.....	
2,031	90,000	.003820	.000300	.....	.....	
2,144	95,000	.003970	.000350	.....	.....	
2,257	100,000	.004310	.000340	.000730	.000420	
2,370	105,000	.004700	.000390	.....	.....	
2,483	110,000	.005140	.000440	.....	.....	
2,596	115,000	.005760	.000620	.....	.....	
2,708	120,000	.006560	.000800	.002010	.001280	
2,821	125,000	.007560	.001000	.....	.....	
2,934	130,000	.010220	.002660	.....	.....	
2,955	130,930	.014100	.003880	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	130,930
Elongation per inch after rupture	inch..	.008
Dimensions at point of rupture		″.118×″.118
Reduction in area after rupture, per centum of original section		38.3
Position of rupture		2″.6 outside the ganged length
Character of broken surface		fine silky

Samples of wire taken from experimental cast-iron wire-wound cylinder after completion of the soldering process and dismantling of the cylinder.

No. 747.

Mark, 1.
Sectional area, ″.1495×″.1495=.02235 square inch.
Gauged length 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
112	5,000	0.	0.	Initial load.
224	10,000	.0018	.....	
335	15,000	.0033	.....	
447	20,000	.0051	.0001	
559	25,000	.0069	.....	
671	30,000	.0088	.....	
783	35,000	.0103	.....	
894	40,000	.0122	.0003	
1,006	45,000	.0138	.....	
1,118	50,000	.0152	.....	
1,229	55,000	.0178	.....	
1,341	60,000	.0193	.0004	
1,453	65,000	.0210	.....	
1,565	70,000	.0230	.....	
1,676	75,000	.0248	.....	
1,788	80,000	.0267	.0006	
1,900	85,000	.0287	.....	
2,012	90,000	.0304	.....	
2,123	95,000	.0326	.....	
2,235	100,000	.0346	.0008	
2,347	105,000	.0367	.....	
2,459	110,000	.0392	.....	
2,570	115,000	.0417	.....	
2,682	120,000	.0449	.0043	
2,794	125,000	.0480	.....	
2,906	130,000	.0504	.....	
3,017	135,000	.0532	.....	
3,129	140,000	.0567	.0094	
3,241	145,000	.0600	.....	
3,353	150,000	.0644	.....	
3,464	155,000	.0690	.....	
3,576	160,000	.0750	.0190	
3,688	165,000	.0813	.....	
3,800	170,000	.0878	.....	
4,046	181,029	.....	.....	Tensile strength.
0	0	.11	.....	

Fractured 2″.1 inside the gauged length.
Area at fracture, ″.133×″.133=.0177 square inch.
Contraction, 20.8 per cent.
Appearance, silky.

No. 748.

Mark, 2.
Sectional area, ″.149×″.149=.0222 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
111	5,000	0.	0.	Initial load.
222	10,000	.0018	.....	
333	15,000	.0036	.....	
444	20,000	.0052	0.	
555	25,000	.0060	.....	
666	30,000	.0082	.....	
777	35,000	.0102	.....	
888	40,000	.0121	.0005	
999	45,000	.0142	.....	
1,110	50,000	.0160	.....	
1,221	55,000	.0178	.....	
1,332	60,000	.0193	.0009	
1,443	65,000	.0210	.....	
1,554	70,000	.0229	.....	
1,665	75,000	.0249	.....	
1,776	80,000	.0268	.0009	
1,887	85,000	.0285	.....	
1,998	90,000	.0305	.....	
2,109	95,000	.0326	.....	
2,220	100,000	.0346	.0022	
2,331	105,000	.0365	.....	
2,442	110,000	.0390	.....	
2,553	115,000	.0412	.....	
2,664	120,000	.0433	.0039	
2,775	125,000	.0459	.....	
2,886	130,000	.0484	.....	
2,997	135,000	.0507	.....	
3,108	140,000	.0536	.0068	
3,219	145,000	.0564	.....	
3,330	150,000	.0593	.....	
3,441	155,000	.0631	.....	
3,552	160,000	.0682	.0120	
3,663	165,000	.0712	.....	
3,774	170,000	.0763	.....	
4,124	185,774	.....	.....	Tensile strength.
0	0	.63	.....	

Area at fracture, ″.132×″.132=.0174 square inch.
Contraction, 21.6 per cent.
Fractured 2″ outside the gauged length.
Appearance, silky; light-colored metal at the circumference.

No. 749.

Mark, 3.
Sectional area, ′.1495×″.1495=.02235 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
112	5,000	0.	0.	Initial load.
224	10,000	.0013	.....	
335	15,000	.0033	.....	
447	20,000	.0049	0.	
559	25,000	.0064	.....	
671	30,000	.0081	.....	
782	35,000	.0094	.....	
894	40,000	.0114	.0001	
1,006	45,000	.0131	.....	
1,118	50,000	.0149	.....	
1,229	55,000	.0166	.....	
1,341	60,000	.0182	.0002	
1,453	65,000	.0201	.....	
1,565	70,000	.0221	.....	
1,676	75,000	.0239	.....	
1,788	80,000	.0260	.0008	
1,900	85,000	.0279	.....	
2,012	90,000	.0299	.....	
2,123	95,000	.0319	.....	
2,235	100,000	.0340	.0022	
2,347	105,000	.0362	.....	
2,459	110,000	.0387	.....	
2,570	115,000	.0408	.....	
2,682	120,000	.0433	.0041	
2,794	125,000	.0460	.....	
2,906	130,000	.0486	.....	
3,017	135,000	.0508	.....	
3,129	140,000	.0550	.0089	
3,241	145,000	.0582	.....	
3,353	150,000	.0619	.....	
3,464	155,000	.0659	.....	
3,576	160,000	.0712	.0163	
3,688	165,000	.0769	.....	
3,800	170,000	.0860	.....	
4,056	181,923	.....	.....	Tensile strength.

Area at fracture, ″.135×″.135=.0182 square inch.
Contraction, 18.6 per cent.
Fractured 2½″ inside the gauged length.
Appearance, fine silky.

Sample of wire which broke while winding the experimental cast-iron cylinder.

Sectional area, ″.149×″.149=.022 square inch.
Tensile strength, 3,890 pounds=176,820 pounds per square inch.
Area at fracture, ″.148×″.148=.0219 square inch.
Contraction, 1.3 per cent.
Fractured 4″ from break in wire which occurred during winding. Appearance, silky. Surface, conchoidal.

Tinned steel wire tested after treatment by heating and cooling.

No. 1. Tested as cut from coil.
No. 2. Heated and plunged into water.
No. 3. Stream of water on tongs and wire until cooled.
No. 4. Heated and tongs taken off, and wire cooled as soon as brazing would have set.
No. 5. Heated and allowed to cool in hot tongs.

Sectional area of wire, ″.149×″.149=.0222 square inch.

Test number.	Mark.	Tensile strength.		Area at fracture.	Contraction of area.
		Total.	Per square inch.		
		Pounds.	*Pounds.*	*In. In. Sq. in.*	*Per cent.*
1147	1	3,815	171,850	.130×.130=.0169	23.9
1148	2	2,020	91,000	.100×.100=.0100	55.0
1149	2	1,980	89,190	.100×.100=.0100	55.0
1150	3	2,010	90,050	.100×.100=.0100	55.0
1151	3	1,930	86,940	.100×.100=.0100	55.0
1152	4	1,880	84,680	.100×.100=.0100	55.0
1153	4	1,915	86,260	.090×.090=.0081	63.5
1154	5	1,830	82,430	.095×.095=.0090	59.5
1155	5	1,920	86,480	.095×.095=.0090	59.5
1156	Spliced wires with teeth.	1,480	66,670	Separated along the splice.	
1157		1,590	71,620		
1158		900	40,540		
1159		1,540	69,370		

All the heated wires fractured near the end of the heated section; the opposite end also drawing down at this point.

Tests of brazed splices with interlocking teeth of ″.15 steel wire which have been swaged after brazing.

No. 2297.

Marks, III.
Tensile strength, 1,480 pounds.
Separated along scarf of weld.

No. 2298.

Marks, IIII.
Tensile strength, 1,820 pounds.
Fractured at end of scarf.

No. 2299.

Marks, IIIII.
Tensile strength, 1,910 pounds.
Fractured in scarf following joint ½ inch.

Tabulation of tests of ".15 square steel wire specimens from twenty selected billets.

Test number.	Mark.	Tensile strength per square inch.	Elongation.		Contraction of area.	Location of fracture.	Appearance of fracture.
			At 140,000 pounds per square inch.	After rupture.			
		Pounds.	*Per ct.*	*Per ct.*	*Per ct.*		
2302	I	160, 850	.8	.9	16.0	5⅛″ outside the ganged length.	Fine silky.
2303	II	161, 800	.9	.9	23.9	3″.8 inside the ganged length.	Do.
2304	III	159, 730	.8	.6	21.5	5″.6 outside the ganged length.	Do.
2305	IV	166, 370	.8	1.5	21.2	1½″ outside the ganged length.	Do.
2306	V	170, 710	.8	1.3	10.8	5⅛″ outside the ganged length.	Do.
2307	VI	157, 190	1.0	1.4	27.5	6½″ outside the ganged length.	Do.
2308	VII	153, 150	.8	.4	2.1	3½″ outside the ganged length. At defective spot in the corner of wire.	Fine silky for the sound metal.
2309	VIII	148, 410	1.0	.6	28.8	4⅛″ outside the ganged length.	Fine silky.
2310	IX	166, 670	.8	2.6	17.0	2″ from middle of ganged length.	Do.
2311	X	144, 400	1.0	.5	27.4	7″ outside the ganged length.	Do.
2312	XI	175, 890	.7	.8	13.7	5″ outside the ganged length.	Do.
2313	XII	163, 990	.9	.8	20.9	5″ outside the ganged length.	Do.
2314	XIII	167, 130	.9	2.4	16.0	2″ inside the ganged length.	Do.
2315	XIV	158, 600	.9	.6	21.3	5⅛″ outside the ganged length.	Do.
2316	XV	164, 200	.8	1.0	19.4	6⅜″ outside the ganged length.	Do.
2317	XVI	157, 740	.9	.7	20.4	5⅛″ outside the ganged length.	Do.
2318	XVII	144, 530	.9	.3	2.4	4″.8 outside the ganged length. At defective spot in wire.	Fine silky for the sound metal.
2319	XVIII	157, 440	.9	.6	21.9	5″ outside the ganged length.	Fine silky.
2320	XIX	166, 6.0	.8	2.5	20.9	At middle of ganged length.	Do.
2321	XX	164, 890	.8	.8	20.2	4″ outside the ganged length.	Do.

Samples of wire taken from experimental cast-iron wire-wound cylinder after completion of the soldering process and dismantling of the cylinder.

Test number.	Mark.	Tensile strength per square inch.	Elongation.		Contraction of area.	Location of fracture.	Appearance of fracture.
			At 140,000 pounds per square inch.	After rupture.			
		Pounds.	*Per ct.*	*Per ct.*	*Per ct.*		
747	1	181,029	.6	1.1	20.8	2″.1 inside the gauged length.	Silky.
748	2	185,774	.5	.3	21.6	2″ outside the gauged length.	Silky, light colored metal at circumference.
749	3	181,923	.5	.....	18.6	2¼″ inside the gauged length.	Fine silky.
[Samples have received a light annealing after the fifth draught.]							
1675	.....	130,790	.....	2.3	35.1	.....	Fine silky.
1676	.....	130,840	.....	.4	40.4	Outside the gauged length.	Do.
1677	.....	134,510	.....	1.2	30.7	1″.3 outside the gauged length.	Do.
1678	.....	128,050	.....	2.3	30.7	.....	Do.
1679	.....	130,930	.....	.8	38.3	2″.6 outside the gauged length.	Do.

OUND STEEL WIRE.

[Foreign manufacture.]

No. 2300.

Straightened from a coil 8″ diameter before testing.
Diameter, ″.0880.
Sectional area, .00608 square inch.
Gauged length, 10″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
30.4	5,000	0.	0.	0.	0.	Initial load.
60.8	10,000	.000240	.000240			
91.2	15,000	.000440	.000200			
121.6	20,000	.000590	.000150			
152.0	25,000	.000820	.000230			
182.4	30,000	.001010	.000190			
212.8	35,000	.001160	.000150			
243.2	40,000	.001340	.000180			
273.6	45,000	.001520	.000180			
304.0	50,000	.001740	.000220			
334.4	55,000	.001900	.000160			
364.8	60,000	.002110	.000210			
395.2	65,000	.002330	.000220			
425.6	70,000	.002520	.000190			
456.0	75,000	.002730	.000210			
486.4	80,000	.002920	.000190			
516.8	85,000	.003120	.000200			
547.2	90,000	.003330	.000210			
577.6	95,000	.003510	.000180			
608.0	100,000	.003720	.000210			
638.4	105,000	.003940	.000220			
668.8	110,000	.004180	.000240			
699.2	115,000	.004400	.000220			
729.6	120,000	.004700	.000300			
760.0	125,000	.004950	.000250			
790.4	130,000	.005200	.000250			
820.8	135,000	.005500	.000300			
851.2	140,000	.005790	.000290			
881.6	145,000	.006100	.000310			
912.0	150,000	.006350	.000250			
942.4	155,000	.006690	.000340			
972.8	160,000	.007030	.000340			
1,003.2	165,000	.007380	.000350			
1,033.6	170,000	.007740	.000360			
1,064.0	175,000	.008160	.000420			
1,094.4	180,000	.008570	.000410			
1,124.8	185,000	.009070	.000500			
1,155.2	190,000	.009520	.000450			
1,185.6	195,000	.010090	.000570			
1,216.0	200,000	.010750	.000660			
1,246.4	205,000	.011630	.000880			
1,276.8	210,000	.012470	.000840			
1,478.0	243,090					Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	243,090
Elongation per inch after rupture	inch..	.025
Reduction in diameter at point of rupture	do...	.024
Reduction in area after rupture, per centum of original section		47.1
Position of rupture		at middle of length
Character of broken surface		fine silky

No. 2301.

From same coil as No. 2300, annealed by heating cherry red in a gas jet and cooling in open air.

Diameter, ″.0880.

Sectional area, .00608 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
30.4	5,000	0.	0.	0.	0.	Initial load.
60.8	10,000	.000230	.000230	.....	.....	
91.2	15,000	.000410	.000180	.....	.....	
121.6	20,000	.000590	.000180	.....	.....	
152.0	25,000	.000760	.000170	.....	.....	
182.4	30,000	.000920	.000160	.....	.....	
212.8	35,000	.001120	.000200	.....	.....	
243.2	40,000	.001280	.000160	.....	.....	
273.6	45,000	.001480	.000200	.....	.....	
304.0	50,000	.001650	.000170	.....	.....	
334.4	55,000	.001860	.000210	.....	.....	
364.8	60,000	.002030	.000170	.....	.....	
395.2	65,000	.002250	.000220	.....	.....	
425.6	70,000	.002460	.000210	.....	.....	
456.0	75,000	.002750	.000290	.....	.....	
486.4	80,000	.003120	.000370	.....	.....	
516.8	85,000	.003550	.000430	.....	.....	
547.2	90,000	.004870	.001320	.....	.....	
577.6	95,000	.008550	.003680	.....	.....	
736.0	121,050	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	121,050
Elongation per inch after rupture	inch..	.038
Reduction in diameter at point of rupture	do...	.035
Reduction in area after rupture, per centum of original section		63.7
Position of rupture		8″ outside the gauged length
Character of broken surface		fine silky

EXPERIMENTAL CAST-IRON WIRE-WOUND CYLINDER.

This experiment consisted in winding a cast-iron cylinder with thirty-seven layers of steel wire ".15 square, laying two wires at a time, each under a tension of 900 pounds total, or 40,000 pounds per square inch.

Previous to winding the cylinder was measured; its external and internal diameters and length, and also diameters on each flat face, were established by center punch marks and their distance apart measured.

The dimensions were all referred to standard bars of wrought iron kept in the same room with the cylinder.

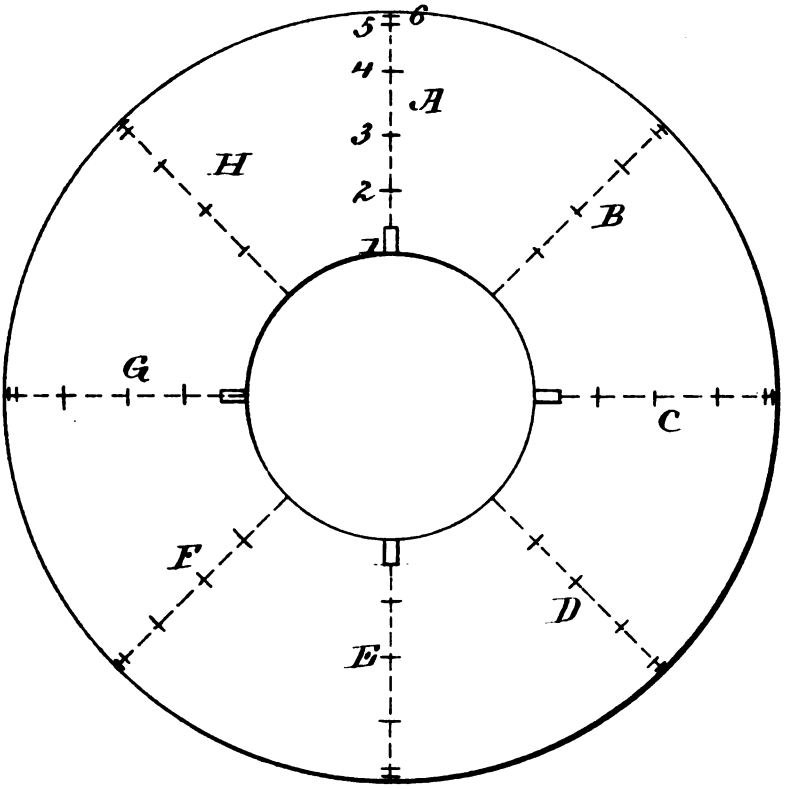
During the progress of winding the accessible diameters of the bore were measured from time to time.

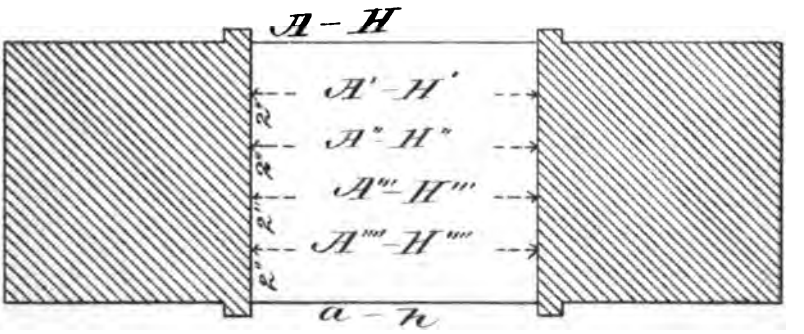
When the winding was completed and the cylinder removed from the lathe, a complete set of measurements was taken, excepting the external diameters, which were covered with wire wrapping.

These measurements were again repeated after the process of soldering and after dismantling.

The diameters of the bore at face *a h* were repeatedly measured before winding began, it having been found that the apparent diameters varied on different occasions when compared with the wrought-iron standard bar. The difference in diameters then observed was attributed to the difference between the mean temperature of the standard bar and the cylinder, and while the standard bar had the temperature of the surface of the cylinder, the interior metal did not immediately follow the changes in temperature of the testing-room.

Experimental wire-wound cylinder
Cast iron.





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Tables showing variations in diameters of bore of cylinder at different temperatures.

Date of measurements.	Temperature of testing-room.	Lines of measurements.			
		a	*b*	*c*	*d*
	Degrees.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
August 18		11.0004	10.9996	10.9994	11.0004

VARIATIONS.

August 19, a. m	78	—.0002	—.0003	—.0004	—.0002
August 19, p. m	85	—.0001	—.0003	—.0003	—.0001
August 20, a. m	76	—.0004	—.0006	—.0008	—.0005
August 20, p. m	80	—.0002	—.0003	—.0004	—.0002
August 21, a. m	75	—.0003	—.0003	—.0005	—.0003
August 21, p. m	78	0.	—.0001	—.0003	0.
August 22, a. m	82–79	0.	—.0001	—.0003	0.
August 22, p. m	86	.0002	.0001	—.0001	—.0002
August 24, a. m	84–80	—.0004	—.0006	—.0008	—.0004
August 24, p. m	86	0.	—.0002	—.0003	0.
August 25, a. m	84–80	—.0003	—.0004	—.0006	—.0003
August 25, p. m	75	—.0001	—.0002	—.0004	—.0001
August 26, a. m	76–71	—.0002	—.0004	—.0006	—.0002
August 26, p. m	72	—.0002	—.0004	—.0006	—.0002
August 27, a. m	70	—.0003	—.0004	—.0007	—.0003
August 27, p. m	77	—.0001	—.0002	—.0004	—.0001

Diameters of bore of cylinder.

	Line of measurements.				Means.
	A	B	C	D	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	11.0016	11.0006	11.0006	11.0014	11.00105
After 37 layers of wire	10.9855	10.9843	10.9845	10.9849	10.98480
Compression	.0161	.0163	.0161	.0165	.01625
After soldering	10.9884	10.9877	10.9878	10.9882	10.988025
Recovery due to soldering	.0029	.0034	.0033	.0033	.003225
After dismantling	10.9989	10.9981	10.9978	10.9986	10.99835
Recovery between soldering and dismantling	.0105	.0104	.0100	.0104	.010325
Permanent set	.0027	.0025	.0028	.0028	.0027

	Line of measurements.				Means.
	A′	B′	C′	D′	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	11.0015	11.0006	11.0004	11.0015	11.0010
After 37 layers of wire	10.9851	10.9842	10.9840	10.9850	10.984575
Compression	.0164	.0164	.0164	.0165	.016425
After soldering	10.9881	10.9877	10.9873	10.9882	10.987825
Recovery due to soldering	.0030	.0035	.0033	.0032	.003250
After dismantling	10.9988	10.9980	10.9975	10.9987	10.998250
Recovery between soldering and dismantling	.0107	.0103	.0102	.0105	.010425
Permanent set	.0027	.0026	.0029	.0028	.002750

Tables showing variations in diameters of bore of cylinder at different temperatures—Cont'd.

	Line of measurements.				Means.
	A″	B″	C″	D″	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	11.0000	10.9991	10.9991	10.9999	10.999525
After 37 layers of wire	10.9836	10.9827	10.9828	10.9832	10.983075
Compression	.0164	.0164	.0163	.0167	.016450
After soldering	10.9865	10.9856	10.9859	10.9863	10.986075
Recovery due to soldering	.0029	.0029	.0031	.0031	.003000
After dismantling	10 9976	10.9966	10.9963	10.9970	10.996875
Recovery between soldering and dismantling	.0111	.0110	.0104	.0107	.010800
Permanent set	.0024	.0025	.0028	.0029	.002650

	Line of measurements.				Means.
	A‴	B‴	C‴	D‴	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	11.0001	10.9995	10.9994	11.0000	10.999750
After 37 layers of wire	10.9835	10.9828	10.9826	10.9832	10.983025
Compression	.0166	.0167	.0168	.0168	.016725
After soldering	10.9864	10.9859	10.9857	10.9863	10.986075
Recovery due to soldering	.0029	.0031	.0031	.0031	.003050
After dismantling	10.9974	10.9967	10.9966	10.9972	10.996975
Recovery between soldering and dismantling	.0110	.0108	.0109	.0109	.010900
Permanent set	.0027	.0028	.0028	.0028	.002775

	Line of measurements.				Means.
	A⁗	B⁗	C⁗	D⁗	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	11.0009	11.0000	10.9998	11.0006	11.000325
After 37 layers of wire	10.9841	10.9832	10.9832	10.9839	10.983600
Compression	.0168	.0168	.0166	.0167	.016725
After soldering	10.9872	10.9865	10.9863	10.9871	10.986775
Recovery due to soldering	.0031	.0033	.0031	.0032	.003175
After dismantling	10.9981	10.9972	10.9971	10.9979	10.997575
Recovery between soldering and dismantling	.0109	.0107	.0108	.0108	.010800
Permanent set	.0028	.0028	.0027	.0027	.002750

	Line of measurements.				Means.
	a	*b*	*c*	*d*	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	11.0004	10.9996	10.9994	11.0004	10.999950
After 37 layers of wire	10.9840	10.9829	10.9830	10.9833	10.983300
Compression	.0164	.0167	.0164	.0171	.016650
After soldering	10.9867	10.9856	10.9861	10.9864	10.986200
Recovery due to soldering	.0027	.0027	.0031	.0031	.002900
After dismantling	10.9977	10.9969	10.9968	10.9973	10.997175
Recovery between soldering and dismantling	.0110	.0113	.0107	.0109	.010975
Permanent set	.0027	.0027	.0026	.0031	.002775

Diameters of bore of cylinder, taken while in the lathe during the progress of wire-winding.

	Line of measurements.			
	B	D	*b*	*d*
	Inches.	*Inches.*	*Inches.*	*Inches.*
Original	11.0006	11.0014	10.9996	11.0004
After 7 layers of wire	10.9974	10.9981	10.9967	10.9972
Compression	.0032	.0033	.0029	.0032
After 18 layers of wire	10.9920	10.9925	10.9910	10.9917
Compression	.0086	.0089	.0086	.0087
After 29 layers of wire	10.9873	10.9879	10.9860	10.9866
Compression	.0133	.0135	.0136	.0138
After 37 layers of wire	10.9843	10.9849	10.9831	10.9838
Compression	.0163	.0164	.0165	.0166

Exterior diameters of cylinders.

	Line of measurements.				Means.
	A	B	C	D	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	29.6926	29.6942	29.6915	29.6938	29.693775
After winding and dismantling	29.6908	29.6922	29.6922	29.6915	29.691675
Permanent set	.0018	.0020	.0023	.0023	.002100

	Line of measurements.				Means.
	A′	B′	C′	D′	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	29.6931	29.6936	29.6932	29.6955	29.693850
After winding and dismantling	29.6922	29.6926	29.6920	29.6921	29.692225
Permanent set	.0009	.0010	.0012	.0034	.001625

	Line of measurements.				Means.
	A′	B″	C″	D″	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	29.6925	29.6927	29.6927	29.6942	29.693025
After winding and dismantling	29.6905	29.6909	29.6908	29.6903	29.690625
Permanent set	.0020	.0018	.0019	.0039	.002400

	Line of measurements.				Means.
	A‴	B‴	C‴	D‴	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	29.6926	29.6929	29.6927	29.6959	29.693525
After winding and dismantling	29.6897	29.6899	29.6897	29.6902	29.689900
Permanent set	.0029	.0030	.0030	.0057	.003625

Exterior diameters of cylinders—Continued.

	Line of measurements.				Means.
	A''''	B'''	C''''	D''''	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	29.6914	29.6920	29.6911	29.6951	29.692400
After winding and dismantling	29.6891	29.6894	29.6889	29.6895	29.689225
Permanent set	.0023	.0026	.0022	.0056	.003175

	Line of measurements.				Means.
	a	*b*	*c*	*d*	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	29.6921	29.6936	29.6872	29.6934	29.691575
After winding and dismantling	29.6896	29.6915	29.6861	29.6918	29.689750
Permanent set	.0025	.0021	.0011	.0016	.001825

Surface diameters of cylinder on face A–H.

	Line of measurements.				Means.
	A_2	B_2	C_2	D_2	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	15.6695	15.6805	15.6745	15.6734	15.674475
After 37 layers of wire	15.6539	15.6648	15.6585	15.6575	15.658675
Compression	.0156	.0157	.0160	.0159	.015800
After soldering	15.6566	15.6685	15.6623	15.6616	15.662250
Recovery due to soldering	.0027	.0037	.0038	.0041	.003575
After dismantling	15.6657	15.6779	15.6719	15.6716	15.671775
Recovery between soldering and dismantling	.0091	.0094	.0096	.0100	.009525
Permanent set	.0038	.0026	.0026	.0018	.002700

	Line of measurements.				Means.
	A_3	B_3	C_3	D_3	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	20.3415	20.3464	20.3486	20.3460	20.345625
After 37 layers of wire	20.3256	20.3309	20.3329	20.3304	20.329950
Compression	.0159	.0155	.0157	.0156	.015675
After soldering	20.3284	20.3338	20.3350	20.3325	20.332425
Recovery due to soldering	.0028	.0029	.0021	.0021	.002475
After dismantling	20.3384	20.3445	20.3456	20.3435	20.343000
Recovery between soldering and dismantling	.0100	.0107	.0106	.0110	.010575
Permanent set	.0031	.0019	.0030	.0025	.002625

Surface diameters of cylinder on face A–H—Continued.

	Line of measurements.				Means.
	A_4	B_4	C_4	D_4	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	25.0307	25.0219	25.0302	25.0262	25.027250
After 37 layers of wire	25.0139	25.0049	25.0133	25.0091	25.010300
Compression	.0168	.0170	.0169	.0171	.016950
After soldering	25.0170	25.0085	25.0166	25.0130	25.013775
Recovery due to soldering	.0031	.0036	.0033	.0039	.003475
After dismantling	25.0277	25.0191	25.0274	25.0237	25.024475
Recovery between soldering and dismantling	.0107	.0106	.0108	.0107	.010700
Permanent set	.0030	.0028	.0028	.0025	.002775

	Line of measurements.				Means.
	A_5	B_5	C_5	D_5	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	28.7960	28.7806	28.8032	28.7864	28.791550
After 37 layers of wire	28.7775	28.7630	28.7856	28.7692	28.773825
Compression	.0185	.0176	.0176	.0172	.017725
After soldering	28.7826	28.7667	28.7892	28.7752	28.778425
Recovery due to soldering	.0051	.0037	.0036	.0060	.004600
After dismantling	28.7937	28.7786	28.8012	28.7849	28.789600
Recovery between soldering and dismantling	.0111	.0119	.0120	.0097	.011175
Permanent set	.0023	.0020	.0020	.0015	.001950

	Line of measurements.				Means.
	A_6	B_6	C_6	D_6	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	29.3992	29.4072	29.3960	29.3976	29.400000
After 37 layers of wire	29.3741	29.3672	29.3777	29.3797	29.374675
Compression	.0251	.0400	.0183	.0179	.025325
After soldering	29.3781	29.3707	29.3809	29.3833	29.378250
Recovery due to soldering	.0040	.0035	.0032	.0036	.003575
After dismantling	29.3891	29.3821	29.3925	29.3949	29.389650
Recovery between soldering and dismantling	.0110	.0114	.0116	.0116	.011400
Permanent set	.0101	.0251	.0035	.0027	.010350

Surface diameters of cylinder on face a–h.

	Line of measurements.				Means.
	a_2	b_2	c_2	d_2	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	15.6707	15.6731	15.6739	15.6766	15.673575
After 37 layers of wire	15.6555	15.6589	15.6583	15.6599	15.658150
Compression	.0152	.0142	.0156	.0167	.015425
After soldering	15.6589	15.6614	15.6619	15.6641	15.661575
Recovery due to soldering	.0034	.0025	.0036	.0042	.003425
After dismantling	15.6690	15.6718	15.6723	15.6740	15.671775
Recovery between soldering and dismantling	.0101	.0104	.0104	.0099	.010200
Permanent set	.0017	.0013	.0016	.0026	.001800

Surface diameters of cylinder on face a–h—Continued.

	Line of measurements.				Means of a_3, b_3, & c_3
	a_3	b_3	c_3	d_3	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	20.3481	20.3468	20.3371	.....	20.344000
After 37 layers of wire	20.3304	20.3299	20.3202	.....	20.326833
Compression	.0177	.0169	.0169	.....	.017167
After soldering	20.3338	20.3333	20.3236	20.3290	20.330233
Recovery due to soldering	.0034	.0034	.0034	.....	.003400
After dismantling	20.3454	20.3447	20.3342	20.3396	20.341433
Recovery between soldering and dismantling	.0116	.0114	.0106	.0106	.011200
Permanent set	.0027	.0021	.0019	.....	.002567

	Line of measurements.				Means.
	a_4	b_4	c_4	d_4	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	25.0257	25.0169	25.0204	25.0142	25.019300
After 37 layers of wire	25.0066	24.9985	25.0025	24.9967	25.001075
Compression	.0191	.0184	.0179	.0175	.018225
After soldering	25.0109	25.0020	25.0062	24.9992	25.004575
Recovery due to soldering	.0043	.0035	.0037	.0025	.003500
After dismantling	25.0225	25.0136	25.0185	25.0112	25.016450
Recovery between soldering and dismantling	.0116	.0116	.0123	.0120	.011875
Permanent set	.0032	.0033	.0019	.0030	.002850

	Line of measurements.				Means.
	a_5	b_5	c_5	d_5	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	28.8006	28.7991	28.7981	28.7983	28.799025
After 37 layers of wire	28.7805	28.7805	28.7794	28.7746	28.778750
Compression	.0201	.0186	.0187	.0237	.020275
After soldering	28.7857	28.7850	28.7839	28.7786	28.783300
Recovery due to soldering	.0052	.0045	.0045	.0040	.004550
After dismantling	28.7977	28.7970	28.7957	28.7908	28.795300
Recovery between soldering and dismantling	.0120	.0120	.0118	.0122	.012000
Permanent set	.0029	.0021	.0024	.0075	.003725

	Line of measurements.				Means.
	a_6	b_6	C_6	D_6	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Original	29.3978	29.3967	29.3951	29.3948	29.396100
After 37 layers of wire	29.3748	29.3776	29.3763	29.3765	29.376300
Compression	.0230	.0191	.0188	.0183	.019800
After soldering	29.3828	29.3821	29.3800	29.3803	29.381300
Recovery due to soldering	.0080	.0045	.0037	.0038	.005000
After dismantling	29.3948	29.3947	29.3925	29.3927	29.393675
Recovery between soldering and dismantling	.0120	.0126	.0125	.0124	.012375
Permanent set	.0030	.0020	.0026	.0021	.002425

Measurements of length of cylinder before and after winding.

LENGTH NO. 1.

Lines of measurements.	Original.	After winding.	Elongation.	Mean elongation.
	Inches.	*Inches.*	*Inch.*	*Inch.*
A_1	10.0018	10.0069	.0051	
B_1	10.0008	10.0049	.0041	
C_1	10.0023	10.0072	.0049	
D_1	10.0008	10.0051	.0043	.0042625
E_1	10.0018	10.0059	.0041	
F_1	10.000	10.0040	.0040	
G_1	9.9998	10.0039	.0041	
H_1	10.0003	10.0038	.0035	

LENGTH NO. 2.

A_2	10.0020	10.0062	.0042	
B_2	10.0024	10.0068	.0044	
C_2	10.0003	10.0054	.0051	
D_2	10.0020	10.0063	.0043	.004225
E_2	10.0020	10.0064	.0044	
F_2	10.0000	10.0039	.0039	
G_2	10.0006	10.0045	.0039	
H_2	10.0018	10.0054	.0036	

LENGTH NO. 3.

A_3	10.0008	10.0038	.0030	
B_3	10.0009	10.0046	.0037	
C_3	9.9995	10.0030	.0035	
D_3	10.0001	10.0034	.0033	.003225
E_3	10.0001	10.0033	.0032	
F_3	9.9980	10.0011	.0031	
G_3	9.9983	10.0012	.0029	
H_3	10.0001	10.0032	.0031	

LENGTH NO. 4.

A_4	10.0006	10.0029	.0023	
B_4	10.0008	10.0027	.0019	
C_4	9.9995	10.0017	.0022	
D_4	10.0002	10.0020	.0018	.002125
E_4	9.9997	10.0016	.0019	
F_4	9.9975	9.9987	.0012	
G_4	9.9975	9.9997	.0022	
H_4	9.9997	10.0032	.0035	

LENGTH NO. 5.

A_5	10.0005	10.0021	.0016	
B_5	10.0007	10.0019	.0012	
C_5	9.9987	9.9995	.0008	
D_5	9.9997	10.0007	.0010	.0012625
E_5	9.9994	10.0005	.0011	
F_5	9.9965	9.9972	.0007	
G_5	9.9968	9.9980	.0012	
H_5	9.9989	10.0014	.0025	

LENGTH NO. 6.

A_6	10.0004	10.0021	.0017	
B_6	10.0007	10.0019	.0012	
C_6	9.9985	9.9995	.0010	
D_6	9.9995	10.0007	.0012	.001325
E_6	9.9992	10.0005	.0013	
F_6	9.9960	9.9967	.0007	
G_6	9.9970	9.9980	.0010	
H_6	9.9989	10.0014	.0025	

Cast-iron specimens from cylinder after dismantling.

No. 2600, No. 2601, No. 672, No. 673 } Tangential specimens, next bore.

No. 674, No. 675 } Radial specimens, next bore.

No. 2600.

Mark, 1.
Diameter, ".798.
Sectional area, .50 square inch.
Length, 6".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
1,000	2,000	.000050	.000050	.....	.....	
1,500	3,000	.000100	.000050	.....	.....	
2,000	4,000	.000167	.000067	.....	.....	
2,500	5,000	.000233	.000066	0.	.....	
3,000	6,000	.000300	.000067	.....	.....	
3,500	7,000	.000367	.000067	.....	.....	
4,000	8,000	.000450	.000083	.....	.....	
4,500	9,000	.000533	.000083	.....	.....	
5,000	10,000	.000600	.000067	.000100	.000100	
5,500	11,000	.000700	.000100	.....	.....	
6,000	12,000	.000783	.000083	.....	.....	
6,500	13,000	.000867	.000084	.....	.....	
7,000	14,000	.000950	.000083	.....	.....	
7,500	15,000	.001033	.000083	.000200	.000100	
8,000	16,000	.001150	.000117	.....	.....	
8,500	17,000	.001267	.000117	.....	.....	
9,000	18,000	.001350	.000083	.....	.....	
9,500	19,000	.001467	.000117	.....	.....	
10,000	20,000	.001633	.000166	.000433	.000233	
10,500	21,000	.001783	.000150	.....	.....	
11,000	22,000	.001967	.000184	.....	.....	
11,500	23,000	.002183	.000216	.....	.....	
12,000	24,000	.002450	.000267	.....	.....	
12,500	25,000	.002833	.000383	.001150	.000717	
13,980	27,960	.....	.....	.....	.....	Tensile strength.

Fractured 1" from middle of stem.
Character of broken surface, granular, mottled.

No. 2601.

Mark, 3.
Diameter, ″.798.
Sectional area, .50 square inch.
Length, 6″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
1,000	2,000	.000050	.000050	.....	.....	
1,500	3,000	.000100	.000050	.....	.....	
2,000	4,000	.000167	.000067	.....	.....	
2,500	5,000	.000233	.000066	0.	.....	
3,000	6,000	.000300	.000067	.....	.....	
3,500	7,000	.000350	.000050	.....	.....	
4,000	8,000	.000417	.000067	.....	.....	
4,500	9,000	.000483	.000066	.....	.....	
5,000	10,000	.000567	.000084	.000067	.000067	
5,500	11,000	.000633	.000066	.....	.....	
6,000	12,000	.000717	.000084	.....	.....	
6,500	13,000	.000817	.000100	.....	.....	
7,000	14,000	.000883	.000066	.....	.....	
7,500	15,000	.001000	.000117	.000183	.000116	
8,000	16,000	.001067	.000067	.....	.....	
8,500	17,000	.001150	.000083	.....	.....	
9,000	18,000	.001267	.000117	.....	.....	
9,500	19,000	.001383	.000116	.....	.....	
10,000	20,000	.001550	.000167	.000383	.000200	
10,500	21,000	.001650	.000100	.....	.....	
11,000	22,000	.001800	.000150	.....	.....	
11,500	23,000	.001983	.000183	.....	.....	
12,000	24,000	.002183	.000200	.....	.....	
12,500	25,000	.002500	.000317	.000900	.000517	
14,200	28,400	.....	.....	.....	.....	Tensile strength.

Fractured $\frac{3}{8}$″ from middle of stem.
Character of broken surface, granular, mottled.

No. 672.

Mark, 2.
Length, 9″.05.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
1,000	2,000	.000050	.000050			
1,500	3,000	.000100	.000050			
2,000	4,000	.000150	.000050			
2,500	5,000	.000200	.000050	.000017	.000017	
3,000	6,000	.000283	.000083			
3,500	7,000	.000333	.000050			
4,000	8,000	.000400	.000067			
4,500	9,000	.000467	.000067			
5,000	10,000	.000517	.000050	.000050	.000033	
5,500	11,000	.000567	.000050			
6,000	12,000	.000633	.000066			
6,500	13,000	.000683	.000050			
7,000	14,000	.000750	.000067			
7,500	15,000	.000817	.000067	.000067	.000017	
8,000	16,000	.000867	.000050			
8,500	17,000	.000933	.000066			
9,000	18,000	.001000	.000067			
9,500	19,000	.001067	.000067			
10,000	20,000	.001133	.000066	.000100	.000033	
10,500	21,000	.001200	.000067			
11,000	22,000	.001250	.000050			
11,500	23,000	.001333	.000083			
12,000	24,000	.001383	.000050			
12,500	25,000	.001450	.000067	.000150	.000050	
13,000	26,000	.001517	.000067			
13,500	27,000	.001583	.000066			
14,000	28,000	.001683	.000100			
14,500	29,000	.001750	.000067			
15,000	30,000	.001867	.000117	.000283	.000033	
15,500	31,000	.002000	.000133			
16,000	32,000	.002083	.000083			
16,500	33,000	.002167	.000084			
17,000	34,000	.002233	.000066			
17,500	35,000	.002583	.000350	.001033	.000750	
18,000	36,000	.002817	.000234			
18,500	37,000	.003100	.000283			
19,000	38,000	.003367	.000267			
19,500	39,000	.009500	.006133			
25,490	50,980					Ultimate strength.

Manner of failure, triple flexure.

No. 673.

Mark, 4.
Length, 8″.97.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
1,000	2,000	.000050	.000050	.....	.....	
1,500	3,000	.000083	.000033	.....	.....	
2,000	4,000	.000133	.000050	.....	.....	
2,500	5,000	.000183	.000050	0.	.....	
3,000	6,000	.000250	.000067	.....	.....	
3,500	7,000	.000300	.000050	.....	.....	
4,000	8,000	.000350	.000050	.....	.....	
4,500	9,000	.000417	.000067	.....	.....	
5,000	10,000	.000467	.000050	.000017	.000017	
5,500	11,000	.000533	.000066	.....	.....	
6,000	12,000	.000583	.000050	.....	.....	
6,500	13,000	.000650	.000067	.....	.....	
7,000	14,000	.000700	.000050	.....	.....	
7,500	15,000	.000767	.000067	.000033	.000016	
8,000	16,000	.000833	.000066	.....	.....	
8,500	17,000	.000883	.000050	.....	.....	
9,000	18,000	.000933	.000050	.....	.....	
9,500	19,000	.001000	.000067	.....	.....	
10,000	20,000	.001067	.000067	.000067	.0 0334	
10,500	21,000	.001117	.000050	.....	.....	
11,000	22,000	.001183	.000066	.....	.....	
11,500	23,000	.001250	.000067	.....	.....	
12,000	24,000	.001333	.000083	.....	.....	
12,500	25,000	.001383	.000050	.000083	.000016	
13,000	26,000	.001433	.000050	.....	.....	
13,500	27,000	.001500	.000067	.....	.....	
14,000	28,000	.001583	.000083	.....	.....	
14,500	29,000	.001650	.000067	.....	.....	
15,000	30,000	.001750	.000100	.000167	.000084	
15,500	31,000	.001833	.000083	.....	.....	
16,000	32,000	.001917	.000084	.....	.....	
16,500	33,000	.002067	.000150	.....	.....	
17,000	34,000	.002200	.000133	.....	.....	
17,500	35,000	.002367	.000167	.000483	.000316	
18,000	36,000	.002533	.000166	.....	.....	
18,500	37,000	.002750	.000217	.....	.....	
19,000	38,000	.003000	.000250	.....	.....	
19,500	39,000	.003250	.000250	.....	.....	
20,000	40,000	.003633	.000383	.001417	.000934	
26,280	52,560	.....	.....	.....	.....	Ultimate strength.

Manner of failure, triple flexure.

No. 674.

Mark, 8.
Length, 9″.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
1,000	2,000	.000033	.000033	.....	.....	
1,500	3,000	.000067	.000034	.....	.....	
2,000	4,000	.000100	.000033	.....	.....	
2,500	5,000	.000150	.000050	0.	.....	
3,000	6,000	.000183	.000033	.....	.....	
3,500	7,000	.000250	.000067	.....	.....	
4,000	8,000	.000300	.000050	.....	.....	
4,500	9,000	.000350	.000050	.....	.....	
5,000	10,000	.000417	.000067	0.	.....	
5,500	11,000	.000483	.000066	.....	.....	
6,000	12,000	.000533	.000050	.....	.....	
6,500	13,000	.000583	.000050	.....	.....	
7,000	14,000	.000633	.000050	.....	.....	
7,500	15,000	.000683	.000050	.000033	.000033	
8,000	16,000	.000733	.000050	.....	.....	
8,500	17,000	.000783	.000050	.....	.....	
9,000	18,000	.000850	.000067	.....	.....	
9,500	19,000	.000917	.000067	.....	.....	
10,000	20,000	.000967	.000050	.000067	000034	
10,500	21,000	.001017	.000050	.....	.....	
11,000	22,000	.001083	.000066	.....	.....	
11,500	23,000	.001167	.000084	.....	.....	
12,000	24,000	.001200	.000033	.....	.....	
12,500	25,000	.001283	.000083	.0001 0	.0 0033	
13,000	26,000	.001350.	.000067	.....	.....	
13,500	27,000	.001417	.000067	.....	.....	
14,000	28,000	.001500	.000083	.....	.....	
14,500	29,000	.001583	.000083	.....	.....	
15,000	30,000	.001667	.000084	.000217	.000117	
15,500	31,000	.001767	.000100	.....	.....	
16,000	32,000	.001850	.000083	.....	.....	
16,500	33,000	.0 2000	.000150	.....	.....	
17,000	34,000	.002100	.000100	.....	.....	
17,500	35,000	.002267	.000167	.000550	.000333	
18,000	36,000	.002417	.000150	.....	.....	
18,500	37,000	.002617	.000200	.....	.....	
19,000	38,000	.002833	.000216	.....	.....	
19,500	39,000	.003033	.000200	.....	.....	
20,000	40,000	.003333	.000300	.001350	.000800	
25,560	51,120	.....	.....	.....	.....	Ultimate strength.

Manner of failure, triple flexure.

No. 675.

Mark, 9.
Length, 9″.01.
Diameter, ″.798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
1,000	2,000	.000067	.000067	.....	.....	
1,500	3,000	.000117	.000050	.....	.....	
2,000	4,000	.000167	.000050	.....	.....	
2,500	5,000	.000217	.000050	.000033	.000033	
3,000	6,000	.000283	.000066	.....	.....	
3,500	7,000	.000317	.000034	.....	.....	
4,000	8,000	.000367	.000050	.....	.....	
4,500	9,000	.000433	.000066	.....	.....	
5,000	10,000	.000483	.000050	.000100	.000067	
5,500	11,000	.000550	.000067	.....	.....	
6,000	12,000	.000600	.000050	.....	.....	
6,500	13,000	.000650	.000050	.....	.....	
7,000	14,000	.000717	.000067	.....	.....	
7,500	15,000	.000767	.000050	.000117	.000017	
8,000	16,000	.000833	.000066	.....	.....	
8,500	17,000	.000900	.000067	.....	.....	
9,000	18,000	.000967	.000067	.....	.....	
9,500	19,000	.001017	.000050	.....	.....	
10,000	20,000	.001067	.000050	.000167	.000050	
10,500	21,000	.001133	.000066	.....	.....	
11,000	22,000	.001217	.000084	.....	.....	
11,500	23,000	.001283	.000066	.....	.....	
12,000	24,000	.001333	.000050	.....	.....	
12,500	25,000	.001417	.000084	.000217	.000050	
13,000	26,000	.001500	.000083	.....	.....	
13,500	27,000	.001583	.000083	.....	.....	
14,000	28,000	.001667	.000084	.....	.....	
14,500	29,000	.001750	.000083	.....	.....	
15,000	30,000	.001900	.000150	.000417	.000200	
15,500	31,000	.002000	.000100	.....	.....	
16,000	32,000	.002100	.000100	.....	.....	
16,500	33,000	.002250	.000150	.....	.....	
17,000	34,000	.002417	.000167	.....	.....	
17,500	35,000	.002600	.000183	.000833	.000416	
18,000	36,000	.002833	.000233	.....	.....	
18,500	37,000	.003033	.000200	.....	.....	
19,000	38,000	.003433	.000400	.....	.....	
19,500	39,000	.003733	.000300	.....	.....	
20,000	40,000	.004067	.000334	.002000	.001167	
25,820	51,640	.....	.....	.....	.....	Ultimate strength.

Manner of failure, triple flexure.

MEASUREMENTS OF A CAST-IRON INITIAL TENSION RING.

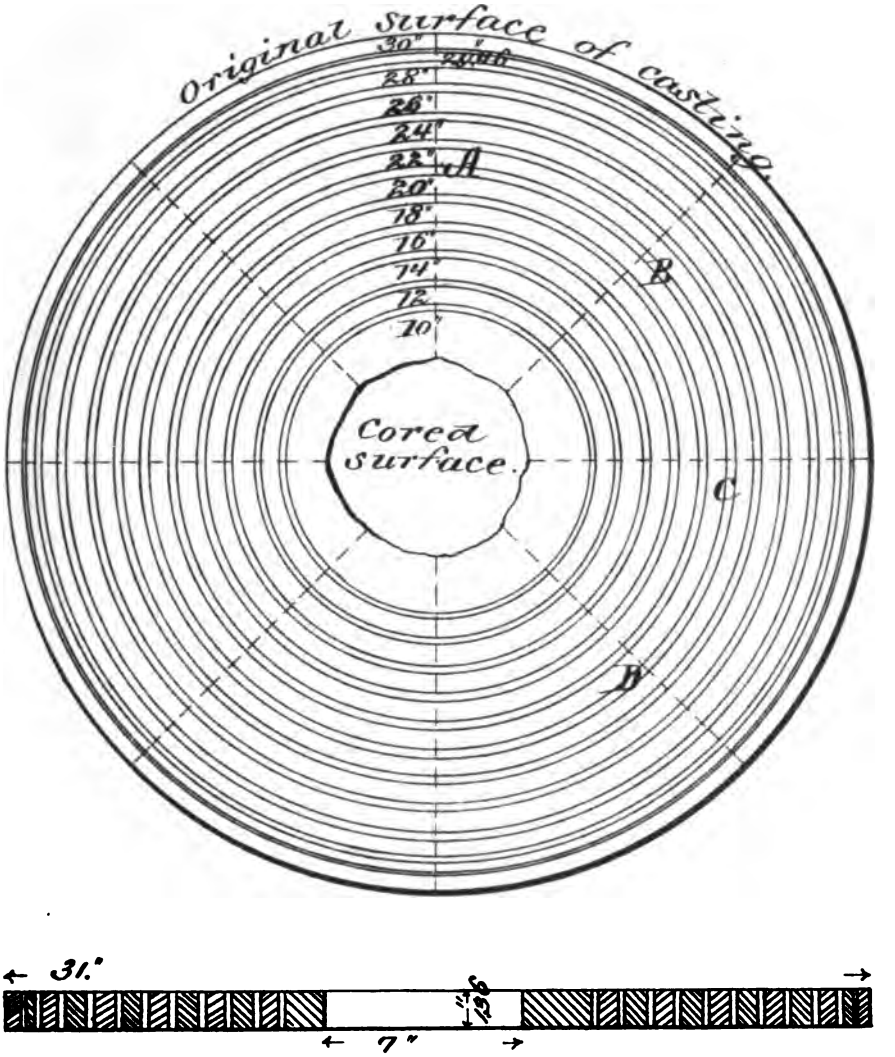
Table 1 shows measurements of diameters laid off on surface of ring before cutting up.

Table 2 shows diameters after removing an external and an internal ring, reducing the diameters of the initial tension ring to 29″.68 and 11″, respectively.

Table 3 shows diameters measured on the detached rings after having been detached by circular grooves midway the measured diameters.

Initial tension ring.

Cast iron.



H Ex 31 49 2

TABLE 1.—*Original dimensions of ring as cut from sinking head.*

Ring.	Diameters.				Mean.
	A	B	C	D	
Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*
30	29.9952	29.9001	29.9974	29.9975	29.99505
28	28.0090	27.9997	28.0078	28.0022	28.00168
26	26.0082	26.0034	26.0040	26.0050	26.00538
24	24.0035	24.0075	24.0018	24.0105	24.00583
22	22.0045	22.0053	22.0078	22.0065	22.00593
20	20.0028	20.0008	20.0064	20.0013	20.00283
18	18.0130	18.0155	18.0172	18.0147	18.01510
16	16.0112	16.0128	16.0127	16.0144	16.01278
14	14.0155	14.0103	14.0133	14.0095	14.01215
12	12.0096	12.0156	12.0146	12.0121	12.01298
10	10.0266	10.0255	10.0240	10.0229	10.02475

TABLE 2.—*Dimensions after finishing to radial dimensions of trial cylinder.*

30*	30.0166	30.0496	30.0189	29.9719	30.01425
29.46	29.4647	29.4635	29.4686	29.4632	29.46500
28	28.0080	27.9981	28.0065	28.0011	28.00343
26	26.0066	26.0014	26.0026	26.0049	26.00388
24	24.0020	24.0066	24.0010	24.0095	24.00488
22	22.0033	22.0036	22.0066	22.0047	22.00455
20	20.0019	19.9997	20.0057	20.0006	20.00198
18	18.0118	18.0139	18.0152	18.0130	18.01348
16	16.0099	16.0110	16.0102	16.0125	16.01090
14	14.0137	14.0088	14.0113	14.0079	14.01042
12	12.0084	12.0145	12.0128	12.0109	12.01165
10*	10.0291	10.0285	10.0294	10.0262	10.02830

* Detached rings.

TABLE 3.—*Dimensions of rings after being detached.*

30	30.0166	30.0496	30.0189	29.9719	30.01425
29.46	29.4630	29.4665	29.4703	29.4618	29.46555
28	28.0064	27.9954	28.0050	28.0000	28.00170
26	26.0050	25.9985	25.9990	26.0020	26.00128
24	24.0004	24.0036	23.9983	24.0074	24.00243
22	22.0021	22.0019	22.0045	22.0030	22.00288
20	20.0008	19.9983	20.0034	19.9980	20.00035
18	18.0122	18.0142	18.0152	18.0130	18.01365
16	16.0111	16.0124	16.0111	16.0124	16.01175
14	14.0164	14.0111	14.0131	14.0101	14.01268
12	12.0112	12.0174	12.0160	12.0129	12.01438
10	10.0291	10.0285	10.0294	10.0262	10.02830

SPECIMEN FROM 4".2 SHOT, CAST AT WATERTOWN ARSENAL SEPTEMBER 12, 1885.

No. 590.

Compression test.
Length, 4".005.
Diameter, .".798.
Sectional area, .50 square inch.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
1,000	2,000	.000050	.000050	0.	.....	
1,500	3,000	.000100	.000050	0.	.....	
2,000	4,000	.000150	.000050	0.	.....	
2,500	5,000	.000250	.000100	0.	.....	
3,000	6,000	.000300	.000050	0.	.....	
3,500	7,000	.000400	.000100	0.	.....	
4,000	8,000	.000500	.000100	0.	.....	
4,500	9,000	.000550	.000050	0.	.....	
5,000	10,000	.000600	.000050	0.	.....	
5,500	11,000	.000700	.000100	0.	.....	
6,000	12,000	.000800	.000100	0.	.....	
6,500	13,000	.000900	.000100	0.	.....	
7,000	14,000	.000950	.000050	.000050	.000050	
7,500	15,000	.001000	.000050	.000100	.000050	
8,000	16,000	.001100	.000100	.000100	0.	
8,500	17,000	.001150	.000050	.000100	0.	
9,000	18,000	.001250	.000100	.000150	.000050	
9,500	19,000	.001300	.000050	.000150	0.	
10,000	20,000	.001400	.000100	.000150	0.	
10,500	21,000	.001450	.000050	.000200	.000050	
11,000	22,000	.001550	.000100	.000200	0.	
11,500	23,000	.001600	.000050	.000200	0.	
12,000	24,000	.001700	.000100	.000250	.000050	
12,500	25,000	.001750	.000050	.000250	0.	
13,000	26,000	.001850	.000100	.000250	0.	
13,500	27,000	.002000	.000150	.000300	.000050	
14,000	28,000	.002050	.000050	.000300	0.	
14,500	29,000	.002100	.000050	.000350	.000050	
15,000	30,000	.002250	.000150	.000350	0.	
15,500	31,000	.002350	.000100	.000450	.000100	
16,000	32,000	.002500	.000150	.000500	.000050	
16,500	33,000	.002550	.000050	.000500	0.	
17,000	34,000	.002650	.000100	.000550	.000050	
17,500	35,000	.002800	.000150	.000600	.000050	
18,000	36,000	.002900	.000100	.000700	.000100	
18,500	37,000	.003000	.000100	.000750	.000050	
19,000	38,000	.003200	.000200	.000900	.000150	
19,500	39,000	.003350	.000150	.000950	.000050	
20,000	40,000	.003500	.000150	.001100	.000150	
20,500	41,000	.003750	.000250	.001200	.000100	
21,000	42,000	.003900	.000150	.001300	.000100	
21,500	43,000	.004050	.000150	.001350	.000050	
22,000	44,000	.004300	.000250	.001600	.000250	
23,500	47,000	.005250	.000950	.002300	.000700	
24,000	48,000	.005400	.000150	.002450	.000150	
24,500	49,000	.005700	.000300	.002500	.000050	
25,000	50,000	.005950	.000250	.002750	.000250	
48,100	96,200	.....	.....	.....	.....	Ultimate strength.

Manner of failure, crushed at one end.

SINGLE-RIVETED BUTT JOINTS, STEEL PLATE.

1261

SINGLE-RIVETED BUTT JOINTS, STEEL PLATE.

DESCRIPTION OF TESTS AND DISCUSSION OF RESULTS.

The following tests complete a series of two hundred and sixteen single-riveted butt joints in steel plates, in which the thickness of the plates ranged from $\frac{1}{4}''$ to $\frac{3}{4}''$, and the size of the rivets from $\frac{9}{16}''$ to $1\frac{3}{16}''$ diameter.

The plates were annealed after shearing to size, the edges opposite the joint milled to the finished width; the holes were drilled and rivets machine-driven. Iron rivets were used throughout, except in some of the $\frac{3}{4}''$ joints.

Tensile tests of the plates and rivet metal, together with the tests of the joints in $\frac{1}{4}''$ and $\frac{3}{8}''$ plate, are contained in the Report of Tests of 1885, Senate Document No. 36, Forty-ninth Congress, first session.

The tests herewith presented comprise the details and tabulation of joints in $\frac{1}{2}''$, $\frac{5}{8}''$, and $\frac{3}{4}''$ thickness of plate, a portion of which were tested hot.

The gauged length in which elongations and sets were measured was $5''$; $2\frac{1}{2}''$ each side of the center line of the joint.

During the progress of testing the same characteristics were displayed which were referred to in the previous report. The joints were very rigid under the early loads. This rigidity is overcome by loads which exceed the friction between the plate and covers, after which the stretching proceeded slowly with some fluctuations till elongation of the metal of the net section became general; the metal under compression in front of the rivets yielding, also the rivets themselves.

The behavior of joints in different thicknesses of plate is substantially the same, and an examination of the results shows that when exposed to similar conditions the strength per unit of fractured metal is nearly the same, whether $\frac{1}{4}''$ or $\frac{3}{4}''$ plate is used.

It will not be understood from this, however, that as a consequence the same efficiency may be obtained in different thicknesses of plate for single-riveted work, because it will be seen that certain essential conditions change as we approach the stronger joints in different thicknesses of plate.

A riveted joint of the maximum efficiency should fracture the plate along the line of riveting, for it is clear that if failure occurs in any other manner, as by shearing the rivets or tearing out the plate in front of the rivet holes, there remains an excess of strength along the line of riveting, or in other words along the net section of metal—if in a single riveted joint—which has not been made use of; but when fracture occurs along the net section an excess of strength in other directions is immaterial.

If the strength per unit of metal of the net section was constant, it would be a very simple matter to compute the efficiency of any joint, as it would merely be the ratio of the net to the gross areas of the plates.

The tenacity of the net section, however, varies, and this variation extends over wide limits.

In the present series there is an excess in strength of the net section over the strength of the tensile test pieces in all joints.

Special tables have been prepared showing this behavior.

The efficiencies shown in Table No. 1 are obtained by dividing the tensile stress on the gross area of plate by the tensile strength of the plate as represented by the strength of the tensile test strip, stating the values in per cent. of the latter.

Table No. 2 exhibits the differences between the efficiencies of the joints and the ratios of net to gross areas of plate. If the tenacity of net section remained constant per unit of area, the efficiencies in Table No. 1 would, as above explained, be identical with the ratios of net to gross areas of plate, and the values in this table reduced to zero.

Table No. 3 shows the excess in strength of the net section of the joint over the strength of the tensile test strip in per cent. of the latter.

Table No. 4 exhibits the compression on the bearing surface of the rivets in connection with the excess in tensile strength of the net section of plate.

Table No. 1 is valuable in showing at once the value of different joints wherein the pitch of the rivets and their diameters vary.

It is seen there is considerable latitude allowed in the choice of rivets and pitch without materially changing the efficiency of the joint; thus in $\frac{1}{4}''$ plate,

$\frac{5}{8}''$ rivets (driven), $1\frac{1}{8}''$ pitch, 72.4 per cent. efficiency,
$\frac{5}{8}''$ rivets (driven), $2\frac{1}{4}''$ pitch, 73.3 per cent. efficiency,
$\frac{7}{8}''$ rivets (driven), $2\frac{3}{8}''$ pitch, 71.5 per cent. efficiency,
$1''$ rivets (driven), $2\frac{1}{4}''$ pitch, 70.3 per cent. efficiency,
$1''$ rivets (driven), $2\frac{7}{8}''$ pitch, 73.8 per cent. efficiency,

give nearly the same results.

In these examples the ratios of net to gross areas of plate range from 60 to 67 per cent., while the rivet areas range from .3067 square inch to .7854 square inch. The actual areas of net sections of plate and rivets are as follows:

	$\frac{5}{8}''$ rivets.	$\frac{7}{8}''$ rivets.	$\frac{1}{2}''$ rivets.	$1''$ rivets.
	Square inches.	*Square inches.*	*Square inches.*	*Square inches.*
Rivets	.3067	.4418	.6013	.7854
Plate	1.486	2.207	2.232	{ 2.259 { 2.319

The areas of the rivets stand to each other as the following numbers:

100 144 196 256

and the net areas of the plate to each other as

100 149 150 { 152
{ 156

From these illustrations it appears that to attain the same degree of efficiency in this quality of metal, although that efficiency is probably not the highest attainable, a fixed ratio between rivet metal and net section of plate is not essential.

In $\frac{1}{2}''$ plate with $\frac{7}{8}''$ rivets the efficiencies of the joints tested cold are nearly constant over the range of pitches tested.

The efficiencies and the ratio of net to gross areas of plate are as follows:

	Pitch.			
	1⅞″	2″	2⅛″	2¼″
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Efficiency	64.5	66.3	66.3	66.4
Ratio of areas	53.4	56.3	58.9	61.1

In this we have illustrated a case which, in passing from the widest pitch, having 61.1 per cent. of the solid plate left, to the narrowest pitch, which had 53.4 per cent. of the solid plate, the gain or excess in strength in the net section almost exactly compensated for the loss of metal.

In Table No. 3 the average of all the joints shows the highest per cent. of excess of strength in the narrowest pitch, and a tendency to lose this excess as the pitch increases.

Tests of detached grooved specimens show the same kind of behavior, but as they are not subject to all the conditions found in a joint, the analogy does not extend very far.

The maximum gain in strength on the net section, not for the time being regarding the hot joints, and disregarding the exceptionally high value of joint No. 1339, ¼″ plate, was 21.2 per cent., the minimum value 2.5 per cent. of the tensile test strip. In other forms of joints, and with punched holes in both iron and steel plate, illustrations are numerous in which there have been large deficiencies, the metal of the net section falling far below the strength of the plate.

It is believed to have been amply shown that increasing the net width diminishes the apparent tenacity of the plate, although other influences may tend to counteract this tendency in some joints.

In order to compare the excess in strength of one thickness of plate with another having the same net widths, we have the following table, rejecting those joints that failed otherwise than along the line of riveting in making these averages:

Thickness of plate.	Width of plate between rivet holes.								
	1″	1⅛″	1¼″	1⅜″	1½″	1⅝″	1¾″	1⅞″	2″
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
¼″	16.7	12.6	11.4	12.0	13.4	8.9	11.5	13.1	10.6
⅜″	18.4	13.7	12.7	13.5	14.6	12.9	9.0	13.6	.....
½″	16.7	14.3	9.3	10.7	9.1	8.8	8.2	12.2	.....
⅝″	17.7	16.3	14.2	14.5	14.6	12.7	9.9	9.8	.....
¾″	11.4	15.1	13.8	14.1	7.6	11.8	10.0	10.1	3.5
Average of all thicknesses	16.2	14.4	12.3	12.9	11.9	11.0	9.7	11.8	7.0

The excess in strength is generally well maintained in each of the several thicknesses, and were it possible to retain the same ratio of net to gross areas of plate, and at the same time equal net widths between rivets, it would seem from this point of view feasible to obtain the same degree of efficiency in thick as in thin plates.

The following causes, however, tend to prevent such a consummation.

For equal net widths thick plates require larger rivets to avoid shearing than thin ones, the diameters of the rivets being somewhat increased for this cause, and again because it has become necessary to increase the metal of the net section in order to retain a suitable ratio of net to gross areas of plate.

There results from these considerations such an increase in net width of plate that the excess in strength displayed by narrower sections is lost, and consequently the result is a joint of lower efficiency.

The data relating to the influence of compression on the bearing surface of the rivets, on the tensile strength of the plate, as shown by Table No. 4 are more or less conflicting. However, in the ¼″ plate, in which the most intense pressures are found, there is seen a pronounced increase in tensile strength as the pressures diminish in intensity.

It is probable that the effects of intense compression would be more conspicuous in a less ductile metal, or one in which the ductility had been impaired by punched holes or otherwise.

A number of joints were tested at temperatures ranging between 200° and 700° Fahr.

The heating was done after the joints were in position for testing, by means of Bunsen burners, arranged in a row parallel to and under the line of riveting.

The temperature was determined with a mercurial thermometer, the bulb of which was immersed in a bath of oil, contained in a pocket drilled in the middle rivet of the joint.

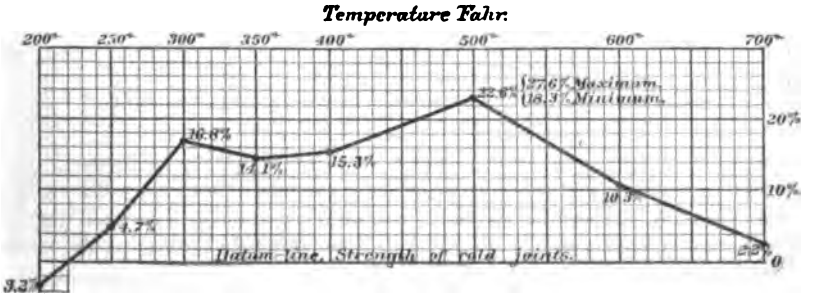
When at the required temperature the thermometer was removed from the joint, a dowel was driven into the pocket to compensate for the metal of the rivet which had been removed by the drill, and then loads applied and gradually increased up to the time of rupture.

Three joints, Nos. 1423, 1426, and 1430, were tested without dowels in the oil pockets.

The method of heating was to raise the temperature of the joint, as shown by the thermometer, a few degrees above the temperature at which the test was made, shut off the gas burners, and allow the temperature to fall to the required limit. The temperature fell slowly, draughts of cold air being excluded from the under side of the joint by the hood which covered the gas burners; the upper side and edges of the joint were covered with fine dry coal ashes.

The results show an increase in tensile strength when heated over the duplicate cold joints at each temperature except 200° Fahr.

From 200° there was a gain in strength up to 300°, when the resistance fell off some at 350°, increased again at 400°, and reached the maximum effect observed at 500° Fahr.; from this point the strength fell rapidly at 600° and 700°.



In per cent. of the cold joint there was a loss at 200° of 3.2 per cent., the average of three joints; at 500° the gain was 22.6 per cent., the average of four joints. The maximum and minimum joints at this temperature showed gains of 27.6 per cent. and 18.3 per cent., respectively.

The highest tensile strength on the net section of plate was found in joint No. 1433, tested at 500° Fahr., where 81,050 pounds per square inch was reached against a strength of 58,000 pounds per square inch in the cold tensile test strip.

The hot joints showed less ductility than the cold ones, those tested at 200° Fahr. not being exempt from this behavior, although there was no near approach to brittleness in any.

Three joints, Nos. 1418, 1420, and 1424, were heated; strained when hot with loads exceeding the ultimate strength of their duplicate cold joints; the loads were released, and after having cooled to the temperature of the testing-room (No. 1424 cooled to 150° Fahr.) were tested to rupture and were found to have retained substantially the strength due their temperature when hot.

In order to ascertain that the time intervening between hot straining and final rupture did not contribute towards the elevation in strength, joint No. 1434 was strained in a similar manner with a load approaching rupture, after which a period of rest was allowed and then ruptured without material gain in strength.

A peculiarity of the joints fractured at 400° and higher temperatures was the comparatively smooth surface of the fractured sections, and which took place in planes making angles of about 50° with the rolled surface of the plate.

The shearing strength of the iron rivets was also increased by an elevation of temperature.

The rivets in joint No. 1410 at the temperature of 350° sheared at 43,060 pounds per square inch, while in the duplicate cold joint No. 1411 they sheared at 38,530 pounds per square inch, and the rivets in joint No. 1398 at 300° Fahr. were loaded with 46,820 pounds per square inch and did not shear.

Other examples, where some of the rivets sheared and the plate fractured in part, showed corresponding gains in shearing strength.

The almost entire absence of granular fractures in these tests is a feature too important to pass by without special mention.

No. 1396

½" steel plate.

H Ex 31 49 2

DETAILS OF TESTS OF RIVETED JOINTS.

Areas.

Plate, gross sectional area	square inches..	5.051
Plate, net sectional area	do....	2.886
Plate, bearing surface of rivets	do....	2.165
Rivets, shearing area	do....	5.301

[Tested at temperature of 200° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
190,700	37,750	.....	.....	Tensile strength.

Fractured plate along line of riveting.
Area at fracture (one section), ″.84×″.31=.2604 square inch.
Contraction, 45.8 per cent.
Appearance silky, slight lamination; open at edges, ″.03 and ″.07.
Elongation of rivet holes, ″.35, ″.36, ″.36, ″.37, ″.38, ″.39.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	37,750
Tension on net section of plate	do....	66,079
Compression on bearing surface of rivets	do....	88,080
Shearing on rivets	do....	35,970

Efficiency of joint, 66.1 per cent.

No. 7397

½" steel plate.

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	5.082
Plate, net sectional area	do....	2.904
Plate, bearing surface of rivets	do....	2.178
Rivets, shearing area	do....	5.301

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
5,082	1,000	0.	0.	Initial load.
10,164	2,000	.0002	.....	
15,246	3,000	.0003	.....	
20,328	4,000	.0005	.....	
25,410	5,000	.0006	.0002	
30,492	6,000	.0007	.....	
35,574	7,000	.0012	.....	
40,656	8,000	.0020	.....	
45,738	9,000	.0043	.....	
50,820	10,000	.0050	.0042	
55,902	11,000	.0054	.....	
60,984	12,000	.0057	.....	
66,066	13,000	.0063	.....	
71,148	14,000	.0067	.....	
76,230	15,000	.0071	.0053	
81,312	16,000	.0080	.....	
86,394	17,000	.0085	.....	
91,476	18,000	.0102	.....	
96,558	19,000	.0115	.....	
101,640	20,000	.0123	.0092	
106,722	21,000	.0140	.....	
111,804	22,000	.0144	.....	
116,886	23,000	.0152	.....	
121,968	24,000	.0163	.....	
127,050	25,000	.0178	.0131	
132,132	26,000	.0220	.....	
137,214	27,000	.0260	.....	
142,296	28,000	.0336	.....	
147,378	29,000	.0418	.....	
152,460	30,000	.0525	.....	
157,542	31,000	.0635	.....	
162,624	32,000	.0755	.....	
167,706	33,000	.0895	.....	
172,788	34,000	.1090	.....	
177,870	35,000	.15	.....	
182,952	36,000	.17	.....	
188,034	37,000	.19	.....	
193,116	38,000	.23	.....	
198,100	38,980	.32	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance silky lamellar; open at edges, ".10 and ".08.
Elongation of rivet holes, ".41, ".41, ".39, ".39, ".39, ".40.
Area at fracture (one section), ".85×".30=.2550 square inch.
Contraction, 47.3 per cent.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	38,980
Tension on net section of plate	do....	68,220
Compression on bearing surface of rivets	do....	90,960
Shearing on rivets	do....	37,370

Efficiency of joint, 68.1 per cent.

No. 7398

½" steel plate.

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	5.445
Plate, net sectional area	do.....	3.267
Plate, bearing surface of rivets	do.....	2.178
Rivets, shearing area	do.....	5.301

[Tested at temperature of 300° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds. 248,200	*Pounds.* 45,560	*Inch.*	*Inch.*	Tensile strength.

Sheared the rivets.
Elongation of rivet holes, ".22, ".14, ".14, ".14, ".14, ".14.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	45,560
Tension on net section of plate	do....	75,960
Compression on bearing surface of rivets	do....	113,960
Shearing on rivets	do....	46,820

No. 1399

½" steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	5.439
Plate, net sectional area	do....	3.266
Plate, bearing surface of rivets	do....	2.173
Rivets, shearing area	do....	5.301

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
5,439	1,000	0.	0.	Initial load.
10,878	2,000	.0003	.....	
16,317	3,000	.0004	.....	
21,756	4,000	.0008	.....	
27,195	5,000	.0010	.0004	
32,634	6,000	.0013	.....	
38,073	7,000	.0019	.....	
43,512	8,000	.0043	.....	
48,951	9,000	.0049	.....	
54,390	10,000	.0057	.0042	
59,829	11,000	.0063	.....	
65,268	12,000	.0072	.....	
70,707	13,000	.0078	.....	
76,146	14,000	.0072	.....	
81,585	15,000	.0091	.0062	
87,024	16,000	.0098	.....	
92,463	17,000	.0109	.....	
97,902	18,000	.0121	.....	
103,341	19,000	.0131	.....	
108,780	20,000	.0142	.0093	
114,219	21,000	.0163	.....	
119,658	22,000	.0175	.....	
125,097	23,000	.0200	.....	
130,536	24,000	.0247	.....	
135,975	25,000	.0392	.0322	
141,414	26,000	.0520	.....	
146,853	27,000	.0610	.....	
152,292	28,000	.0720	.....	
157,731	29,000	.0836	.....	
163,170	30,000	.0930	.....	
168,609	31,000	.1085	.....	
174,048	32,000	.14	.....	
179,487	33,000	.16	.....	
184,926	34,000	.18	.....	
190,365	35,000	.20	.....	
195,804	36,000	.24	.....	
201,243	37,000	.28	.....	
206,682	38,000	.35	.....	
212,121	39,000	.40	.....	
213,600	39,260	.....	.....	Tensile strength.

Fractured plate through two sections and sheared five rivets.
Appearance of fractured plate, silky.
Average elongation of rivet-holes, ".23.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	39,260
Tension on net section of plate	do....	65,409
Compression on bearing surface of rivets	do....	98,200
Shearing on rivets	do....	40,290

Efficiency of joint, 68.6 per cent.

No. 1399

½" steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	5.439
Plate, net sectional area	do....	3.266
Plate, bearing surface of rivets	do....	2.173
Rivets, shearing area	do....	5.301

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
5,439	1,000	0.	0.	Initial load.
10,878	2,000	.0003	.....	
16,317	3,000	.0004	.....	
21,756	4,000	.0008	.....	
27,195	5,000	.0010	.0004	
32,634	6,000	.0013	.....	
38,073	7,000	.0019	.....	
43,512	8,000	.0043	.....	
48,951	9,000	.0049	.....	
54,390	10,000	.0057	.0042	
59,829	11,000	.0063	.....	
65,268	12,000	.0072	.....	
70,707	13,000	.0078	.....	
76,146	14,000	.0072	.....	
81,585	15,000	.0091	.0062	
87,024	16,000	.0098	.....	
92,463	17,000	.0109	.....	
97,902	18,000	.0121	.....	
103,341	19,000	.0131	.....	
108,780	20,000	.0142	.0093	
114,219	21,000	.0163	.....	
119,658	22,000	.0175	.....	
125,097	23,000	.0200	.....	
130,536	24,000	.0247	.....	
135,975	25,000	.0392	.0322	
141,414	26,000	.0520	.....	
146,853	27,000	.0610	.....	
152,293	28,000	.0720	.....	
157,731	29,000	.0836	.....	
163,170	30,000	.0930	.....	
168,609	31,000	.1085	.....	
174,048	32,000	.14	.....	
179,487	33,000	.16	.....	
184,926	34,000	.18	.....	
190,365	35,000	.20	.....	
195,804	36,000	.24	.....	
201,243	37,000	.28	.....	
206,682	38,000	.35	.....	
212,121	39,000	.40	.....	
213,600	39,260	.....	.....	Tensile strength.

Fractured plate through two sections and sheared five rivets.
Appearance of fractured plate, silky.
Average elongation of rivet-holes, ".23.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	39,260
Tension on net section of plate	do....	65,400
Compression on bearing surface of rivets	do....	98,290
Shearing on rivets	do....	40,290

Efficiency of joint, 68.6 per cent.

No. 1400

1/2" Steel plate.

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	5.842
Plate, net sectional area	do	3.655
Plate, bearing surface of rivets	do	2.187
Rivets, shearing area	do	5.301

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
5,842	1,000	0.	0.	Initial load.
11,684	2,000	—.0002	.....	
17,526	3,000	—.0002	.....	
23,368	4,000	—.0001	.....	
29,210	5,000	—.0003	.0002	
35,052	6,000	—.0002	.....	
40,894	7,000	0.	.....	
46,736	8,000	.0012	.....	
52,578	9,000	.0016	.....	
58,420	10,000	.0018	.0032	
64,262	11,000	.0027	.....	
70,104	12,000	.0031	.....	
75,946	13,000	.0034	.....	
81,788	14,000	.0041	.....	
87,630	15,000	.0057	..0071	
93,472	16,000	.0071	.....	
99,314	17,000	.0078	.....	
105,156	18,000	.0101	.....	
110,998	19,000	.0104	.....	
116,840	20,000	.0106	.0102	
122,682	21,000	.0107	.....	
128,524	22,000	.0117	.....	
134,366	23,000	.0125	.....	
140,208	24,000	.0144	.....	
146,050	25,000	.0173	.0143	
151,892	26,000	.0241	.....	
157,734	27,000	.0287	.....	
163,576	28,000	.0380	.....	
169,418	29,000	.0483	.....	
175,260	30,000	.0575	.....	
181,102	31,000	.0703	.....	
186,944	32,000	.0813	.....	
192,786	33,000	.1030	.....	
198,628	34,000	.115	.....	
204,470	35,000	.135	.....	
210,312	36,000	.18	.....	Scale starts off plate.
216,154	37,000	.22	.....	Tensile strength.

Sheared the rivets between plate and top cover.
Elongation of rivet-holes, ".15, ".15, ".15, ".09, ".09, ".12.

Maximum stress on joint

Tension on gross section of plate	pounds per square inch	37,000
Tension on net section of plate	do	59,140
Compression on bearing surface of rivets	do	98,830
Shearing on rivets	do	40,770

Efficiency of joint, 64.7 per cent.

No. 1401

½" Steel plate.

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	5.796
Plate, net sectional area	do	3.622
Plate, bearing surface of rivets	do	2.174
Rivets, shearing area	do	5.301

[Tested at temperature of 350° Fahr.]

Applied loads.		In ganged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
228,500	39,420	.....	.....	Tensile strength.

Sheared the rivets.
Elongation of rivet-holes, ".08 each.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	39,420
Tension on net section of plate	do	63,080
Compression on bearing surface of rivets	do	105,100
Shearing on rivets	do	43,100

No. 1402

½" steel plate.

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	5.416
Plate, net sectional area	do	2.891
Plate, bearing surface of rivets	do	2.525
Rivets, shearing area	do	7.216

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
5,416	1,000	0.	0.	Initial load.
10,832	2,000	.0002	.....	
16,248	3,000	.0005	.....	
21,664	4,000	.0005	.....	
27,080	5,000	.0011	.0002	
32,496	6,000	.0017	.....	
37,912	7,000	.0020	.....	
43,328	8,000	.0026	.....	
48,744	9,000	.0030	.....	
54,160	10,000	.0037	.0030	
59,576	11,000	.0048	.....	
64,992	12,000	.0056	.....	
70,408	13,000	.0062	.....	
75,824	14,000	.0069	.....	
81,240	15,000	.0075	.0053	
86,656	16,000	.0082	.....	
92,072	17,000	.0090	.....	
97,488	18,000	.0099	.....	
102,904	19,000	.0112	.....	
108,320	20,000	.0124	.0092	
113,736	21,000	.0142	.....	
119,152	22,000	.0152	.....	
124,568	23,000	.0172	.....	
129,984	24,000	.0198	.....	
135,400	25,000	.0244	.0185	
140,816	26,000	.0315	.....	
146,232	27,000	.0362	.....	
151,648	28,000	.0422	.....	
157,064	29,000	.0497	.....	
162,480	30,000	.0585	.0497	
167,896	31,000	.0707	.....	
173,312	32,000	.0830	.....	
178,728	33,000	.0997	.....	
184,144	34,000	.1192	.....	
189,560	35,000	.16	.....	
194,976	36,000	.20	.....	
199,800	36,890	.27	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slightly lamellar.
Area at fracture (one section) ".84×".32=.2688 square inch.
Contraction, 44.1 per cent.
Fracture open at edges ".17 and ".10.
Elongation of rivet-holes, ".48, ".44, ".39, ".38, ".37, ".38.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	36,890
Tension on net section of plate	do	69,110
Compression on bearing surface of rivets	do	79,130
Shearing on rivets	do	27,690

Efficiency of joint, 64.5 per cent.

No. 1403

1/2" Steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	5.477
Plate, net sectional area	do	2.926
Plate, bearing surface of rivets	do	2.551
Rivets, shearing area	do	7.216

[Tested at temperature of 250° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds. 209,500	*Pounds.* 38,250	*Inch.*	*Inch.*	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, lamellar, irregular surface.
Area at fracture (one section), ″.86×″.34=.2924 square inch.
Contraction, 39.8 per cent.
Elongation of rivet-holes, ″.32, ″.31, ″.29, ″.30, ″.31, ″.32.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	38,250
Tension on net section of plate	do	71,600
Compression on bearing surface of rivets	do	81,730
Shearing on rivets	do	29,030

Efficiency of joint, 66.9 per cent.

No. 14404

½" steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	5.832
Plate, net sectional area	do....	3.281
Plate, bearing surface of rivets	do....	2.551
Rivets, shearing area	do....	7.219

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
5,832	1,000	0.	0.	Initial load.
11,664	2,000	.0002	.....	
17,496	3,000	.0003	.....	
23,328	4,000	.0008	.....	
29,160	5,009	.0008	.0008	
34,992	6,000	.0013	.....	
40,824	7,000	.0013	.....	
46,656	8,000	.0018	.....	
52,488	9,000	.0021	.....	
58,320	10,000	.0030	.0023	
64,152	11,000	.0036	.....	
69,984	12,000	.0044	.....	
75,816	13,000	.0051	.....	
81,648	14,000	.0061	.....	
87,480	15,000	.0068	.0050	
93,312	16,000	.0073	.....	
99,144	17,000	.0083	.....	
104,976	18,000	.0092	.....	
110,808	19,000	.0103	.....	
116,640	20,000	.0115	.0080	
122,472	21,000	.0128	.....	
128,304	22,000	.0137	.....	
134,136	23,000	.0148	.....	
139,968	24,000	.0166	.....	
145,800	25,000	.0188	.0139	Scale starts off plate.
151,632	26,000	.0231	.....	
157,464	27,000	.0276	.....	Edges of plate contract.
163,296	28,000	.0343	.....	
169,128	29,000	.0423	.....	
174,960	30,000	.0542	.....	
180,792	31,000	.0743	.....	
186,624	32,000	.0923	.....	
192,456	33,000	.1118	.....	
198,288	34,000	.15	.....	
204,120	35,000	.19	.....	
209,952	36,000	.20	.....	
215,784	37,000	.26	.....	
221,100	37,910	.....	.....	Tensile strength.

Fractured along line of riveting.
Appearance of fracture, silky, lamellar. Open at edges ".15 and ".10.
Elongation of rivet-holes, ".47, ".47, ".42, ".42, ".46, ".46.
Area at fracture (one section), ".93×".28=.2604 square inch.
Contraction, 52.3 per cent.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	37,910
Tension on net section of plate	do....	67,380
Compression on bearing surface of rivets	do....	86,670
Shearing on rivets	do....	30,640

Efficiency of joint, 66.3 per cent.

No. 1405

½" steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	5.854
Plate, net sectional area	do...	3.297
Plate, bearing surface of rivets	do...	2.557
Rivets, shearing area	do...	7.216

[Tested at temperature of 300° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds. 256,000	*Pounds.* 43,730	*Inch.*	*Inch.*	Tensile strength.

Fractured plate along line of riveting.
Appearance silky, slight lamination. Open at edges ″.04 and ″.02.
Area at fracture (one section), 1″.01 × ″.37 = .3737 square inch.
Contraction 31.7 per cent.
Elongation of rivet-holes, ″.33, ″.31, ″.29, ″.28, ″.29, ″.31.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	43,730
Tension on net section of plate	do...	77,650
Compression on bearing surface of rivets	do...	100,120
Shearing on rivets	do...	35,480

Efficiency of joint, 76.4 per cent.

No. 1406

½" Steel Plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	5.997
Plate, net sectional area	do...	3.529
Plate, bearing surface of rivets	do...	3.468
Rivets, shearing area	do...	7.216

[Tested at a temperature of 400° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds. 268,600	*Pounds.* 44,790	*Inch.*	*Inch.*	Tensile strength.

Fractured plate along line of riveting.

Appearance, silky, slight lamination.

Fractures oblique, making an angle of 50° with surface of plate. Open at edges ″.03 and ″.17.

Area at fracture (one section), 1″.14×″.36=.4104 square inch.

Contraction, 30.1 per cent.

Elongation of rivet-holes, ″.34, ″.33, ″.32, ″.34, ″.37, ″.40.

Maximum stress on joint.

Tension on gross section plate	pounds per square inch..	44,790
Tension on net section plate	do....	76,110
Compression on bearing surface of rivets	do....	108,830
Shearing on rivets	do....	37,220

Efficiency of joint, 76.7 per cent.

No. 7407

½" steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	6.010
Plate, net sectional area	do	3.537
Plate, bearing surface of rivets	do	2.473
Rivets, shearing area	do	7.216

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
6,010	1,000	0.	0.	Initial load.
12,020	2,000	.0002	.....	
18,030	3,000	.0003	.....	
24,040	4,000	.0005	.....	
30,050	5,000	.0007	.0003	
36,060	6,000	.0012	.....	
42,070	7,000	.0020	.....	
48,080	8,000	.0029	.....	
54,090	9,000	.0036	.....	
60,100	10,000	.0043	.0032	
66,110	11,000	.0051	.....	
72,120	12,000	.0058	.....	
78,130	13,000	.0063	.....	
84,140	14,000	.0071	.....	
90,150	15,000	.0081	.0056	
96,160	16,000	.0095	.....	
102,170	17,000	.0106	.....	
108,180	18,000	.0116	.....	
114,190	19,000	.0122	.....	
120,200	20,000	.0130	.0091	
126,210	21,000	.0141	.....	
132,220	22,000	.0151	.....	
138,230	23,000	.0161	.....	
144,240	24,000	.0176	.....	
150,250	25,000	.0196	.0133	
156,260	26,000	.0221	.....	
162,270	27,000	.0255	.....	
168,280	28,000	.0380	.....	
174,290	29,000	.0580	.....	
180,300	30,000	.0724	.0625	
186,310	31,000	.0905	.....	
192,320	32,000	.1050	.....	
198,330	33,000	.125	.....	
204,340	34,000	.14	.....	
210,350	35,000	.17	.....	
216,360	36,000	.21	.....	
222,370	37,000	.26	.....	
228,380	38,000	.31	.....	
234,390	39,000	.39	.....	
235,700	39,210	.42	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slightly lamellar. Open at edges, ″.20 and ″.15.
Elongation of rivet-holes, ″.58, ″.54, ″.52, ″.50, ″.54, ″.56.
Area at fracture (one section), 1″.04×″.29=.3016 square inch.
Contraction, 48.7 per cent.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	39,210
Tension on net section of plate	do	60,630
Compression on bearing surface of rivets	do	95,310
Shearing on rivets	do	32,660

Efficiency of joint, 66.3 per cent.

No. 7408

1/2" steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	6.561
Plate, net sectional area	do	4.010
Plate, bearing surface of rivets	do	2.551
Rivets, shearing area	do	7.216

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
6,561	1,000	0.	0.	Initial load.
13,122	2,000	—.0001	.....	
19,683	3,000	—.0001	.....	
26,244	4,000	—.0001	.....	
32,805	5,000	.0000	.0001	
39,366	6,000	.0013	.....	
45,927	7,000	.0030	.....	
52,488	8,000	.0037	.....	
59,049	9,000	.0042	.....	
65,610	10,000	.0047	.0044	
72,171	11,000	.0054	.....	
78,732	12,000	.0058	.....	
85,293	13,000	.0067	.....	
91,854	14,000	.0081	.....	
98,415	15,000	.0094	.0084	
104,976	16,000	.0111	.....	
111,537	17,000	.0118	.....	
118,098	18,000	.0124	.....	
124,659	19,000	.0130	.....	
131,220	20,000	.0137	.0108	
137,781	21,000	.0146	.....	
144,342	22,000	.0154	.....	
150,903	23,000	.0162	.....	
157,464	24,000	.0173	.....	
164,025	25,000	.0191	.0145	
170,586	26,000	.0227	.....	
177,147	27,000	.0310	.....	
183,708	28,000	.0550	.....	
190,269	29,000	.0661	.....	
196,830	30,000	.0850	.....	
203,391	31,000	.0985	.....	
209,952	32,000	.1170	.....	
216,513	33,000	.125	.....	
223,074	34,000	.17	.....	
229,635	35,000	.20	.....	
236,196	36,000	.22	.....	Scale starts off plate.
242,757	37,000	.27	.....	
249,318	38,000	.33	.....	
255,879	39,000	.40	.....	
261,500	39,850	.....	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky. Open at edges, ″.15 and ″.20.
Elongation of rivet-holes, ″.66, ″.66, ″.60, ″.60, ″.65, ″.67.
Area at fracture (one section), 1″.14×″.28=.3192 square inch.
Contraction, 52.2 per cent.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	39,850
Tension on net section of plate	do	65,210
Compression on bearing surface of rivets	do	102,500
Shearing on rivets	do	36,230

Efficiency of joint, 66.4 per cent.

No. 7409

7/8" steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	6.512
Plate, net sectional area	do....	3.982
Plate, bearing surface of rivets	do....	2.530
Rivets, shearing area	do....	7.216

[Tested at temperature of 500° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds. 363,500	*Pounds.* 46,610	*Inch.*	*Inch.*	Tensile strength.

Sheared four rivets and fractured the plate across two sections back of center line of rivet-holes.

Appearance, silky, oblique.

Elongation of rivet-holes, ″.21 each where rivets sheared; other two, ″.38 and ″.36.

Area at fracture (one section), 1″.26×″.40=.504 square inch.

Contraction, 23.9 per cent.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	46,610
Tension on net section of plate	do....	76,220
Compression on bearing surface of rivets	do....	119,980
Shearing on rivets	do....	42,060

Efficiency of joint, 77.6 per cent.

No. 7410

½" steel plate

H Ex 31 492

Areas.

Plate, gross sectional area	square inches	6.859
Plate, net sectional area	do	4.374
Plate, bearing surface of rivets	do	2.525
Rivets, shearing area	do	7.216

[Tested at temperature of 350° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
310,700	45,300	.....	.....	Tensile strength.

Sheared tlie rivets.
Elongation of rivet-holes, ″.16 each.

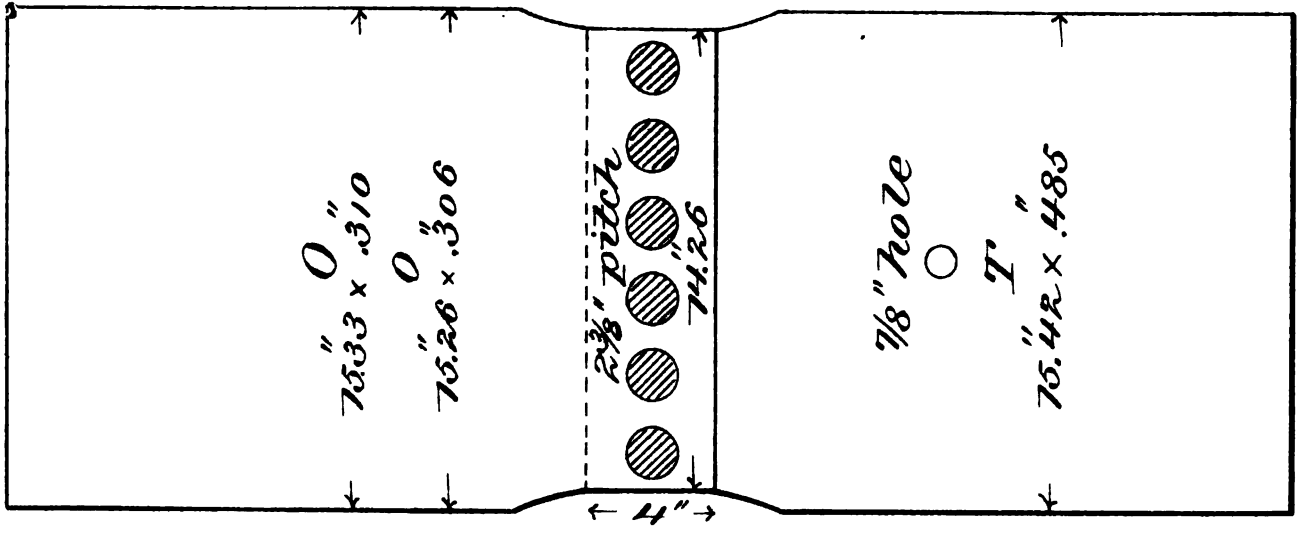
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	45,300
Tension on net section of plate	do	71,690
Compression on bearing surface of rivets	do	123,050
Shearing on rivets	do	43,060

Efficiency of joint, 75.5 per cent.

No. 7411.

½" Steel plate



H Ex 31 492

Areas.

Plate, gross sectional area	square inches..	6.916
Plate, net sectional area	do....	4.370
Plate, bearing surface of rivets	do....	2,546
Rivets, shearing area	do....	7,216

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
6,916	1,000	0.	0.	Initial load.
13,832	2,000	.0003	.....	
20,748	3,000	.0008	.....	
27,664	4,000	.0011	.....	
34,580	5,000	.0022	.0012	
41,496	6,000	.0038	.....	
48,412	7,000	.0046	.....	
55,328	8,000	.0055	.....	
62,244	9,000	.0064	.....	
69,160	10,000	.0088	.0066	
76,076	11,000	.0102	.....	
82,992	12,000	.0113	.....	
89,908	13,000	.0123	.....	
96,824	14,000	.0133	.....	
103,740	15,000	.0140	.0101	
110,656	16,000	.0152	.....	
117,572	17,000	.0161	.....	
124,488	18,000	.0177	.....	
131,404	19,000	.0192	.....	
138,320	20,000	.0207	.0143	
145,236	21,000	.0233	.....	
152,152	22,000	.0251	.....	
159,068	23,000	.0275	.....	
165,984	24,000	.0319	.....	
172,900	25,000	.0395	.0306	
179,816	26,000	.0499	.....	
186,732	27,000	.0594	.....	
193,648	28,000	.0699	.....	
200,564	29,000	.0810	.....	
207,480	30,000	.0960	.....	
214,396	31,000	.1100	.....	
221,312	32,000	.15	.....	
228,228	33,000	.17	.....	
235,144	34,000	.19	.....	
242,060	35,000	.20	.....	
248,976	36,000	.24	.....	
255,892	37,000	.28	.....	
262,808	38,000	.34	.....	
269,724	39,000	.39	.....	
276,640	40,000	.49	.....	
277,000	40,050	.....	.....	Tensile strength.

Sheared the rivets.
Average elongation of rivet-holes ".25.
Transverse diameter of rivet-holes increased ".03.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	40,050
Tension on net section of plate	do....	63,390
Compression on bearing surface of rivets	do....	108,800
Shearing on rivets	do....	38,530

Efficiency of joint, 66.7 per cent.

No. 7412

½" Steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	5.813
Plate, net sectional area	do....	2.909
Plate, bearing surface of rivets	do....	2.904
Rivets, shearing area	do....	9.425

[Tested at temperature of 250° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds. 208,800	*Pounds.* 35,920	*Inch.*	*Inch.*	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, stratified. Middle section open ".05.
Area at fracture (one section), ".89×".35=.3115 square inch.
Contraction, 35.6 per cent.
Elongation of rivet-holes, ".32, ".31, ".30, ".31, ".32, ".33.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	35,920
Tension on net section of plate	do....	71,770
Compression on bearing surface of rivets	do....	71,900
Shearing on rivets	do....	22,150

Efficiency of joint, 62.8 per cent.

No. 7413

½" steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	5.772
Plate, net sectional area	do....	2.886
Plate, bearing surface of rivets	do....	2.886
Rivets, shearing area	do....	9.425

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
5,772	1,000	0.	0.	Initial load.
11,544	2,000	.0002	.....	
17,316	3,000	.0005	.....	
23,088	4,000	.0008	.....	
28,860	5,000	.0011	.0006	
34,632	6,000	.0021	.....	
40,404	7,000	.0039	.....	
46,176	8,000	.0052	.....	
51,948	9,000	.0061	.....	
57,720	10,000	.0068	.0055	
63,492	11,000	.0082	.....	
69,264	12,000	.0091	.....	
75,036	13,000	.0099	.....	
80,808	14,000	.0108	.....	
86,580	15,000	.0118	.0093	
92,352	16,000	.0130	.....	
98,124	17,000	.0141	.....	
103,896	18,000	.0153	.....	
109,668	19,000	.0169	.....	
115,440	20,000	.0184	.0143	
121,212	21,000	.0204	.....	
126,984	22,000	.0227	.....	
132,756	23,000	.0260	.....	
138,528	24,000	.0294	.....	
144,300	25,000	.0344	.0276	
150,072	26,000	.0436	.....	
155,844	27,000	.0535	.....	
161,616	28,000	.0635	.....	
167,388	29,000	.0751	.....	
173,160	30,000	.0900	.0800	
178,932	31,000	.11	.....	
184,704	32,000	.14	.....	
190,476	33,000	.17	.....	
196,248	34,000	.23	.....	
198,500	34,390	.....	.....	Tensile strength.

Fractured plate across line of riveting.
Appearance, silky. Open at edges ".05 and ".03.
Elongation of rivet-holes, ".48, ".47, ".45, ".44, ".43, ".40.
Area at fracture (one section), ".82×".28=.2296 square inch.
Contraction, 52.2 per cent.

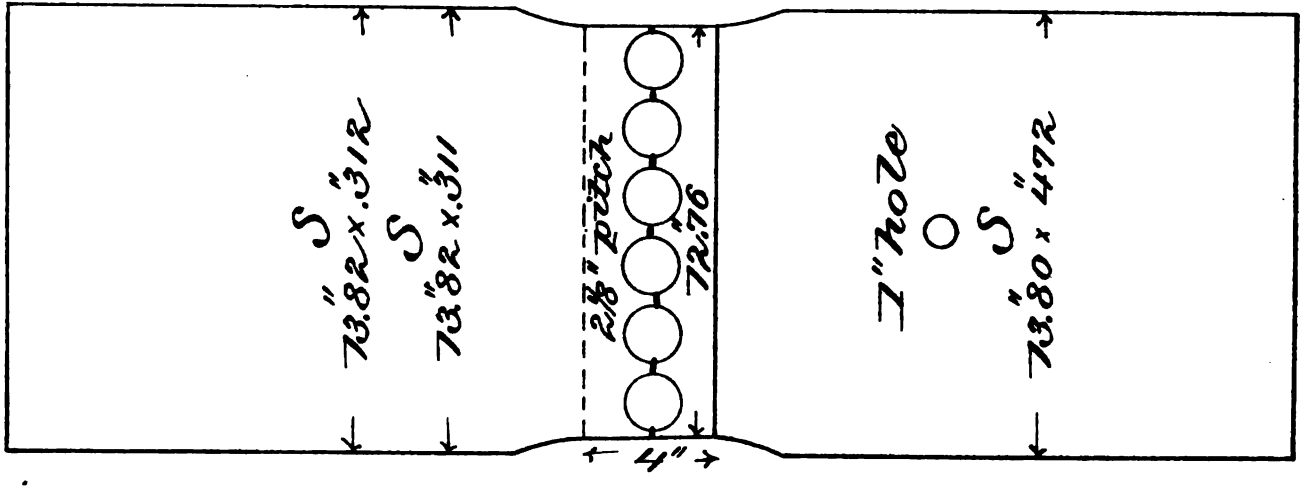
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	34.390
Tension on net section of plate	do....	68.780
Compression on bearing surface of rivets	do....	68.780
Shearing on rivets	do....	21.060

Efficiency of joint, 60.1 per cent.

No. 7414

½" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	6.023
Plate, net sectional area	do	3.191
Plate, bearing surface of rivets	do	2.832
Rivets, shearing area	do	9.425

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
6,023	1,000	0.	0.	Initial load.
12,046	2,000	−.0001		
18,069	3,000	−.0004		
24,092	4,000	−.0003		
30,115	5,000	+.0002	.0001	
36,138	6,000	.0021		
42,161	7,000	.0030		
48,184	8,000	.0036		
54,207	9,000	.0046		
60,230	10,000	.0057	.0051	
66,253	11,000	.0066		
72,276	12,000	.0074		
78,299	13,000	.0086		
84,322	14,000	.0097		
90,345	15,000	.0108	.0091	
96,368	16,000	.0124		
102,391	17,000	.0131		
108,414	18,000	.0139		
114,437	19,000	.0151		
120,460	20,000	.0172	.0136	
126,483	21,000	.0201		
132,506	22,000	.0229		
138,529	23,000	.0275		
144,552	24,000	.0341		
150,575	25,000	.0411	.0356	
156,598	26,000	.0496		
162,621	27,000	.0561		
168,644	28,000	.0676		
174,667	29,000	.0805		
180,690	30,000	.0981	.0890	
186,713	31,000	.12		
192,736	32,000	.16		
198,757	33,000	.19		
204,782	34,000	.23		
210,805	35,000	.3_4		Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slightly lamellar. Open at edges ″.10 and ″.03.
Elongation of rivet-holes, ″.49, ″.45, ″.43, ″.43, ″.46, ″.48.
Area at fracture (one section), ″.94 × ″.30 = .282 square inch.
Contraction, 46.8 per cent.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	35,000
Tension on net section of plate	do	66,020
Compression on bearing surface of rivets	do	74,430
Shearing on rivets	do	22,360

Efficiency of joint, 59.2 per cent.

No. 7475

½" steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	5.967
Plate, net sectional area	do	3.159
Plate, bearing surface of rivets	do	2.808
Shearing area of rivets	do	9.425

[Tested at temperature of 300° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
240,200	40,250	.....	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slightly lamellar. Open at edges ″.03 and ″.01.
Area at fracture (one section), 1″.02×″.35=.3570 square inch.
Contraction, 32.1 per cent.
Elongation of rivet-holes, ″.29, ″.27, ″.26, ″.28, ″.30, ″.31.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	40,250
Tension on net section of plate	do	76,010
Compression on bearing surface of rivets	do	85,540
Shearing on rivets	do	25,480

Efficiency of joint, 68.1 per cent.

No. 7416

½" steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	6.327
Plate, net sectional area	do....	3.519
Plate, bearing surface of rivets	do....	2.808
Rivets, shearing area	do....	9.425

[Tested at temperature of 200° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
219,300	34,660	.....	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, very lamellar. Open at edges, ″.10 and ″.05.
Area at fracture (one section), 1″.07 × ″.30 = .3210 square inch.
Contraction, 45.1 per cent.
Elongation of rivet-holes, ″.47, ″.44, ″.42, ″.41, ″.44, ″.47.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	34,660
Tension on net section of plate	do....	62,320
Compression on bearing surface of rivets	do....	78,090
Shearing on rivets	do....	23,160

Efficiency of joint, 60.3 per cent

No. 7417

½" steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	6.512
Plate, net sectional area	do....	3.620
Plate, bearing surface of rivets	do....	2.892
Rivets, shearing area	do....	9.425

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
6,512	1,000	0.	0.	Initial load.
13,024	2,000	.0001	.....	
19,536	3,000	.0015	.....	
26,048	4,000	.0020	.....	
32,560	5,000	.0022	.0019	
39,072	6,000	.0027	.....	
45,584	7,000	.0046	.....	
52,096	8,000	.0059	.....	
58,608	9,000	.0066	.....	
65,120	10,000	.0074	.0064	
71,632	11,000	.0083	.....	
78,144	12,000	.0088	.....	
84,656	13,000	.0095	.....	
91,168	14,000	.0104	.....	
97,680	15,000	.0119	.0094	
104,192	16,000	.0137	.....	
110,704	17,000	.0148	.....	
117,216	18,000	.0153	.....	
123,728	19,000	.0161	.....	
130,240	20,000	.0177	.0137	
136,752	21,000	.0201	.....	
143,264	22,000	.0229	.....	
149,776	23,000	.0261	.....	
156,288	24,000	.0298	.....	
162,800	25,000	.0380	.0308	
169,312	26,000	.0460	.....	
175,824	27,000	.0540	.....	
182,336	28,000	.0609	.....	
188,848	29,000	.0752	.....	
195,360	30,000	.0943	.0842	
201,872	31,000	.11	.....	
208,384	32,000	.14	.....	
214,896	33,000	.17	.....	
221,408	34,000	.20	.....	
227,920	35,000	.23	.....	
234,432	36,000	.28	.....	
240,680	36,950	.38	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky. Open at edges ″.15 and ″.10.
Area at fracture (one section), 1″.06×″.29=.3074 square inch.
Contraction, 48.9 per cent.
Elongation of rivet-holes, ″.55, ″.52, ″.48, ″.48, ″.48, ″.50.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	36,950
Tension on net section of plate	do....	66,480
Compression on bearing surface of rivets	do....	83,220
Shearing on rivets	do....	25,530

Efficiency of joint, 61.5 per cent.

No. 7418

½" steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	6.859
Plate, net sectional area	do	3.973
Plate, bearing surface of rivets	do	2.886
Rivets, shearing area	do	9.425

[Heated to temperature of 400° Fahr., and loaded with 280,000 pounds tension; after one-half minute the load was released to zero, and the joint cooled to a temperature between 70° and 80° Fahr. Water was sprinkled on the joint to hasten cooling. Permanent set of joint, ".20. Tested cold (about 80° Fahr.) after resting two hours.]

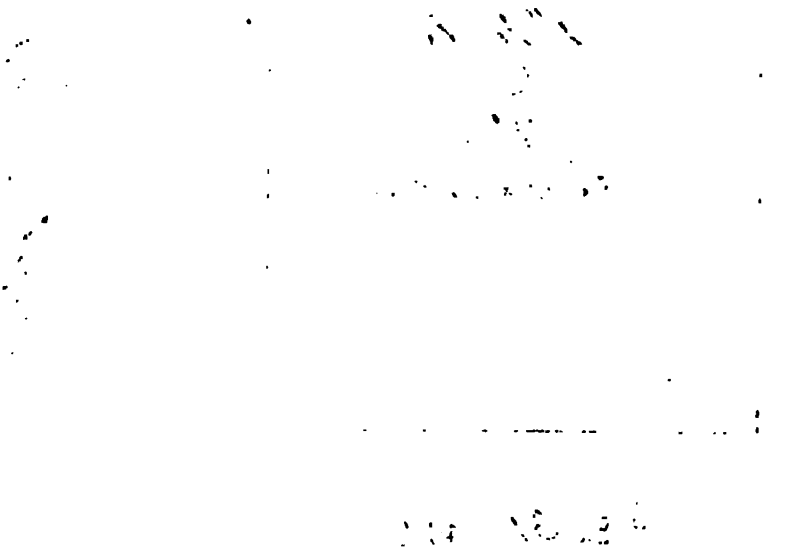
Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
6,859	1,000	0.	0.	Initial load.
13,718	2,000	.0016	.....	
20,577	3,000	.0042	.....	
27,436	4,000	.0051	.....	
34,295	5,000	.0060	.0030	
41,154	6,000	.0065	.....	
48,013	7,000	.0070	.....	
54,872	8,000	.0074	.....	
61,731	9,000	.0079	.....	
68,590	10,000	.0084	.0027	
75,449	11,000	.0084	.....	
82,308	12,000	.0091	.....	
89,167	13,000	.0095	.....	
96,026	14,000	.0100	.....	
102,885	15,000	.0103	.0027	
109,744	16,000	.0105	.....	
116,603	17,000	.0109	.....	
123,462	18,000	.0112	.....	
130,321	19,000	.0114	.....	
137,180	20,000	.0117	.0025	
144,039	21,000	.0122	.....	
150,898	22,000	.0126	.....	
157,757	23,000	.0129	.....	
164,616	24,000	.0132	.....	
171,475	25,000	.0135	.0027	
178,334	26,000	.0142	.....	
185,193	27,000	.0147	.....	
192,052	28,000	.0152	.....	
198,911	29,000	.0153	.....	
205,770	30,000	.0157	.0029	
212,629	31,000	.0160	.....	
219,488	32,000	.0168	.....	
226,347	33,000	.0172	.....	
233,206	34,000	.0173	.....	
240,065	35,000	.0177	.0027	
246,924	36,000	.0178	.....	
253,783	37,000	.0183	.....	
260,642	38,000	.0189	.....	
267,501	39,000	.0195	.....	
274,360	40,000	.0200	.0053	
281,219	41,000	.0225	.....	
		.0237	.....	After 2 minutes rest.
283,000	.....	.0241	.....	
285,000	.....	.0246	.....	
287,000	.....	.0261	.....	
288,078	42,000	.0307	.....	
		.0400	.....	After 2 minutes rest.
299,800	43,710	.18	.....	Tensile strength.

Total elongation from cold state before heating (".20+".18) ".38±.
Fractured plate along line of riveting.
Appearance, silky, slight lamination. Open at edges ".07 each.
Area at fracture (one section), 1".22×".32=.3904 square inch.
Contraction, 40.9 per cent.
Elongation of rivet-holes, ".51, ".46, ".44, ".44, ".44, ".45.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	43,710
Tension on net section of plate	do	75,460
Compression on bearing surface of rivets	do	103,880
Shearing on rivets	do	31,810

Efficiency of joint, 72.8 per cent.



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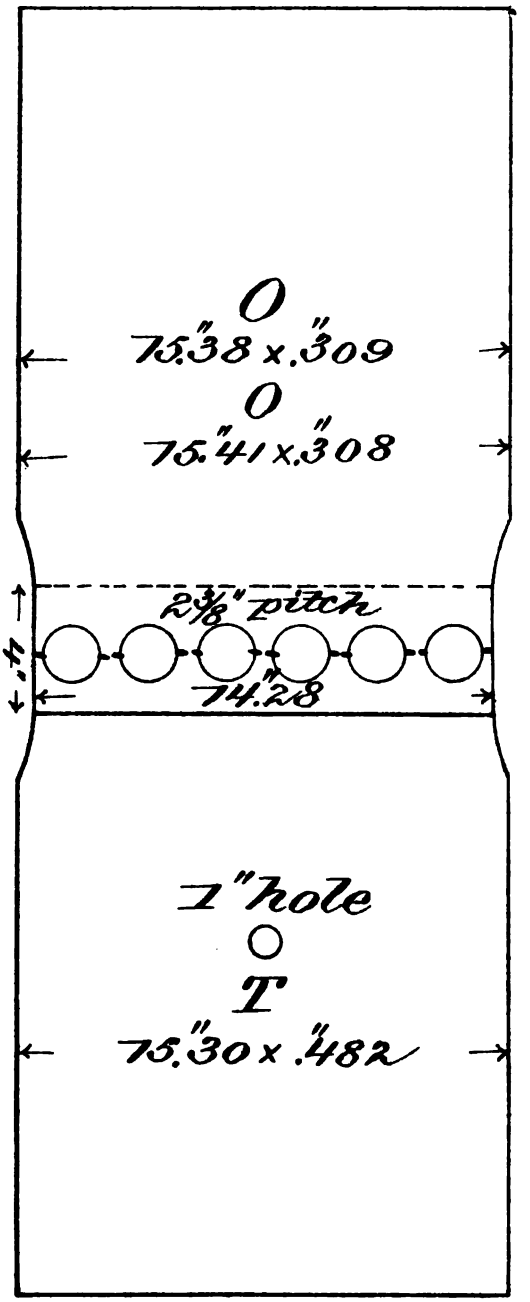


¼" Steel Plate

H Ex 31 492

Areas.

Plate, gross sectional area	square inches	6.883
Plate, net sectional area	do	3.991
Plate, bearing surface of rivets	do	2.892
Rivets, shearing area	do	9.425

Applied loads.		In gauged lengths.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
6,883	1,000	0.	0.	Initial load.
13,766	2,000	0.	.....	
20,649	3,000	.0001	.....	
27,532	4,000	.0002	.....	
34,415	5,000	.0006	.0002	
41,298	6,000	.0019	.....	
48,181	7,000	.0029	.....	
55,064	8,000	.0039	.....	
61,947	9,000	.0050	.....	
68,830	10,000	.0056	.0053	
75,713	11,000	.0078	.....	
82,596	12,000	.0089	.....	
89,479	13,000	.0100	.....	
96,362	14,000	.0108	.....	
103,245	15,000	.0117	.0089	
110,128	16,000	.0130	.....	
117,011	17,000	.0137	.....	
123,894	18,000	.0146	.....	
130,777	19,000	.0157	.....	
137,660	20,000	.0170	.0136	
144,543	21,000	.0188	.....	
151,426	22,000	.0200	.....	
158,309	23,000	.0212	.....	
165,192	24,000	.0232	.....	
172,075	25,000	.0272	.0199	
178,958	26,000	.0355	.....	
185,841	27,000	.0475	.....	
192,724	28,000	.0630	.....	
199,607	29,000	.0775	.....	
206,490	30,000	.0950	.0845	
213,373	31,000	.11	.....	
220,256	32,000	.13	.....	
227,139	33,000	.16	.....	
234,022	34,000	.18	.....	
240,905	35,000	.21	.....	
247,788	36,000	.25	.....	
254,671	37,000	.30	.....	
261,554	38,000	.37	.....	
266,500	38,720	.47	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slight lamination. Open at edges ".13 and ".05.
Elongation of rivet-holes, ".57, ".54, ".53, ".54, ".55, ".60.
Area at fracture (one section), 1".20×".29=.3480 square inch.
Contraction, 38.1 per cent.

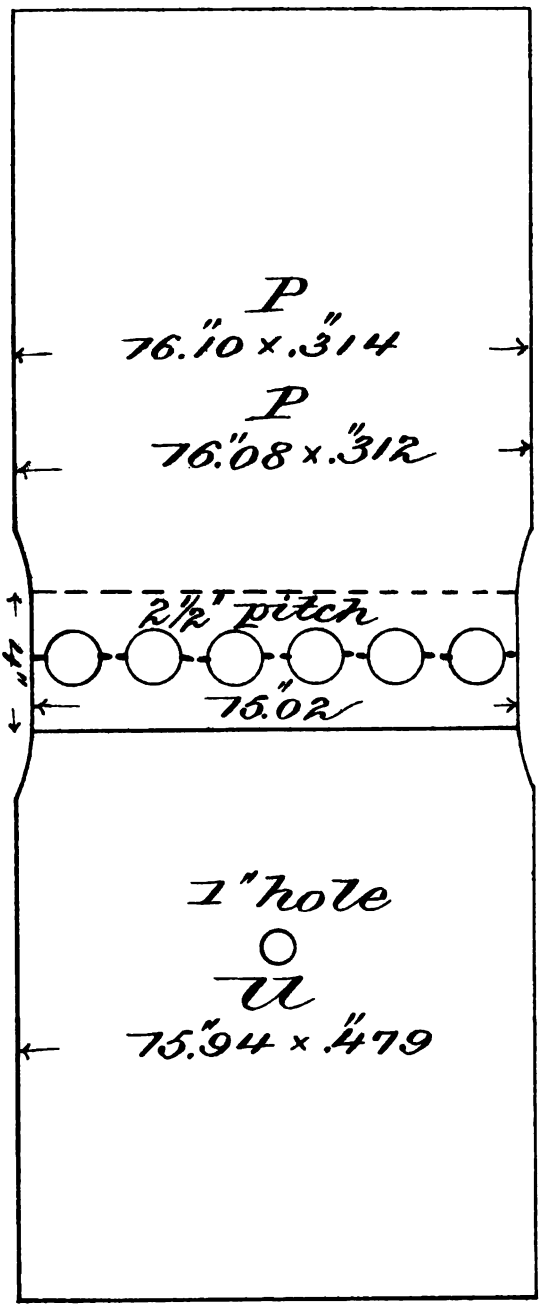
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	38,720
Tension on net section of plate	do	66,770
Compression on bearing surface of rivets	do	92,150
Shearing on rivets	do	28,270

Efficiency of joint, 64.5 per cent.

No. 7420

½" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	7.194
Plate, net sectional area	do....	4.320
Plate, bearing surface of rivets	do....	2.874
Rivets, shearing area	do....	9.425

[Heated to temperature of 500° Fahr. and loaded with 300,000 pounds tension, which was at once removed. The joint now allowed to cool to the temperature of the room (72° Fahr.), and after a rest of five hours tested cold in the usual manner. Permanent set caused by load when hot, ".27 in 5 inches."]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
7,194	1,000	0.	0.	Initial load.
14,388	2,000	.0008	.....	
21,582	3,000	.0019	.....	
28,776	4,000	.0027	.....	
35,970	5,000	.0030	.0009	
43,164	6,000	.0037	.....	
50,358	7,000	.0046	.....	
57,552	8,000	.0050	.....	
64,746	9,000	.0054	.....	
71,940	10,000	.0056	.0011	
79,134	11,000	.0061	.....	
86,328	12,000	.0065	.....	
93,522	13,000	.0070	.....	
100,716	14,000	.0072	.....	
107,910	15,000	.0076	.0010	
115,104	16,000	.0080	.....	
122,298	17,000	.0084	.....	
129,492	18,000	.0090	.....	
136,686	19,000	.0093	.....	
143,880	20,000	.0095	.0010	
151,074	21,000	.0100	.....	
158,268	22,000	.0105	.....	
165,462	23,000	.0109	.....	
172,656	24,000	.0111	.....	
179,850	25,000	.0115	.0010	
187,044	26,000	.0122	.....	
194,238	27,000	.0125	.....	
201,432	28,000	.0130	.....	
208,626	29,000	.0132	.....	
215,820	30,000	.0136	.0014	
223,014	31,000	.0141	.....	
230,208	32,000	.0145	.....	
237,402	33,000	.0150	.....	
244,596	34,000	.0155	.....	
251,790	35,000	.0161	.0015	
258,984	36,000	.0163	.....	
266,178	37,000	.0169	.....	
273,372	38,000	.0175	.....	
280,566	39,000	.0183	.....	
287,760	40,000	.0198	.0045	
294,954	41,000	.0215	.....	
302,148	42,000	.0245	.....	
309,342	43,000	.0340	.....	
316,536	44,000	.1150	.....	
322,600	44,840	.27	.....	Tensile strength.

Total elongation from cold state before heating (".27+.27), ".54.
Fractured plate along line of riveting.
Appearance, silky, slight lamination. Open at edges ".08 and ".06.
Area at fracture (one section), 1".31×".33=.4323 square inch.
Contraction, 39.8 per cent.
Elongation of rivet-holes, ".60, ".54, ".53, ".53, ".52, ".55.

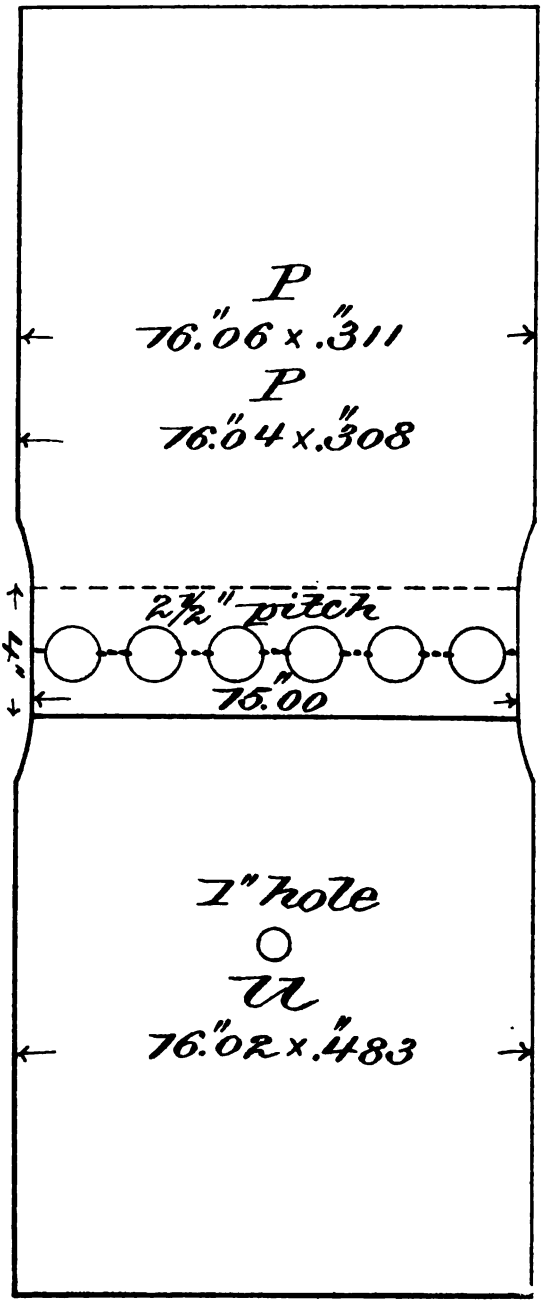
Maximum stress on joint.

Tension on gross section of plate	pounds per square inches..	44,840
Tension on net section of plate	do....	74,670
Compression on bearing surface of rivets	do....	112,250
Shearing on rivets	do....	34,230

Efficiency of joint, 77.3 per cent.

No 7421

½" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	7.245
Plate, net sectional area	do	4.347
Plate, bearing surface of rivets	do	2.898
Rivets, shearing area	do	9.425

Applied loads.		In ganged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
7,945	1,000	0.	0.	Initial load.
14,490	2,000	.0001	.....	
21,735	3,000	.0002	.....	
28,980	4,000	.0003	.....	
36,225	5,000	.0018	.0017	
43,470	6,000	.0039	.....	
50,715	7,000	.0052	.....	
57,960	8,000	.0066	.....	
65,205	9,000	.0073	.....	
72,450	10,000	.0085	.0077	
79,695	11,000	.0095	.....	
86,940	12,000	.0106	.....	
94,185	13,000	.0120	.....	
101,430	14,000	.0141	.....	
108,675	15,000	.0143	.0122	
115,920	16,000	.0155	.....	
123,165	17,000	.0168	.....	
130,410	18,000	.0179	.....	
137,655	19,000	.0187	.....	
144,900	20,000	.0202	.0167	
152,145	21,000	.0221	.....	
159,390	22,000	.0236	.....	
166,635	23,000	.0254	.....	
173,880	24,000	.0308	.....	
181,125	25,000	.0400	.0332	Rested 1 hour under initial load.
188,370	26,000	.0538	.....	
195,615	27,000	.0668	.....	
202,860	28,000	.0798	.....	
210,105	29,000	.0980	.....	
217,350	30,000	.1145	.1030	
224,595	31,000	.13	.....	
231,840	32,000	.16	.....	
239,085	33,000	.18	.....	
246,330	34,000	.22	.....	
253,575	35,000	.27	.....	
260,820	36,000	.30	.....	
268,065	37,000	.35	.....	
275,310	38,000	.43	.....	
280,700	38,740	.58	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slight lamination. Open at edges ″.25 and ″.05.
Elongation of rivet-holes, ″.79, ″.70, ″.66, ″.59, ″.61, ″.63.
Area at fracture (one section), 1″.30×″.29=.3770 square inch.
Contraction, 47.9 per cent.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	38,740
Tension on net section of plate	do	64,570
Compression on bearing surface of rivets	do	96,850
Shearing on rivets	do	29,780

Efficiency of joint, 66.9 per cent.

No. 7482

½" steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	6.167
Plate, net sectional area	do....	3.822
Plate, bearing surface of rivets	do....	2.345
Rivets, shearing area	do....	7.854

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
6,167	1,000	0.	0.	Initial load.
12,334	2,000	—.0001	.....	
18,501	3,000	—.0001	.....	
24,668	4,000	.0000	.....	
30,835	5,000	.0000	.0000	
37,002	6,000	.0003	.....	
43,169	7,000	.0060	.....	
49,336	8,000	.0072	.....	
55,503	9,000	.0081	.....	
61,670	10,000	.0091	.0066	
67,837	11,000	.0099	.....	
74,004	12,000	.0103	.....	
80,171	13,000	.0110	.....	
86,338	14,000	.0118	.....	
92,505	15,000	.0130	.0117	
98,672	16,000	.0147	.....	
104,839	17,000	.0161	.....	
111,006	18,000	.0175	.....	
117,173	19,000	.0185	.....	
123,340	20,000	.0195	.0170	
129,507	21,000	.0210	.....	
135,674	22,000	.0225	.....	
141,841	23,000	.0248	.....	
148,008	24,000	.0284	.....	
154,175	25,000	.0375	.0322	
160,342	26,000	.0519	.....	
166,509	27,000	.0640	.....	
172,676	28,000	.0789	.....	
178,843	29,000	.0951	.....	
185,010	30,000	.1149	.1048	
191,177	31,000	.125	.....	
197,344	32,000	.16	.....	
203,511	33,000	.19	.....	
209,678	34,000	.22	.....	
215,845	35,000	.26	.....	
222,012	36,000	.29	.....	
228,179	37,000	.33	.....	
234,346	38,000	.40	.....	
240,513	39,000	.48	.....	
245,050	39,730	.61	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, lamellar. Open at edges ".17 and ".25.
Elongation of rivet-holes, ".73, ".70, ".77, ".77, ".76.
Area at fracture (one section), 1".42×".30=.4260 square inch.
Contraction, 44.1 per cent.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	39,730
Tension on net section of plate	do....	64,110
Compression on bearing surface of rivets	do....	104,490
Shearing on rivets	do....	31,200

Efficiency of joint, 67.2 per cent.

No. 7423

½" steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	6.220
Plate, net sectional area	do...	3.855
Plate, bearing surface of rivets	do...	2.365
Rivets, shearing area	do...	7.854

[Tested at temperature of 400° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds. 282,500	*Pounds.* 45,420	*Inch.*	*Inch.*	Tensile strength.

Fractured the plate through four sections, tearing out at the middle to the edge of the plate. Sheared the middle rivet, which had been weakened by the drilled pocket in which the thermometer was used to determine the temperature of the joint.

Appearance of fractures, silky, lamellar.

Elongation of rivet-holes, ″.40, ″.36 (″.18 rivet sheared in this hole), ″.48, ″.53.

Area at fracture (one section), 1″.53×″.38=.5814 square inch.

Contraction, 24.3 per cent.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	45,420
Tension on net section of plate	do....	73,250
Compression on bearing surface of rivets	do....	119,450
Shearing on rivets	do....	35,840

Efficiency of joint, 76.9 per cent.

No. 74124

½" steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	6.660
Plate, net sectional area	do....	4.240
Plate, bearing surface of rivets	do....	2.420
Rivets, shearing area	do....	7.854

[Tested at temperature of 500° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
310,000	46,550	.....	.....	Maximum load applied when the specimen slipped in the holder jaws. The emery cloth used to increase the friction of the grip was renewed. The temperature of the joint was lowered to 150° Fahr. and tensile load again applied.
326,000	48,950	.....	.....	Tensile strength.

Sheared four rivets and fractured one end section of the plate.

Elongation of rivet-holes, ".30, ".30, ".25, ".37.

The dowel in third rivet did not fill the hole properly, accounting for the variation in the elongation of rivet-holes.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	48,950
Tension on net section of plate	do....	76,890
Compression on bearing surface of rivets	do....	137,160
Shearing on rivets	do....	41,510

Efficiency of joint, 81.5 per cent.

No. 7425

½" steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	6.632
Plate, net sectional area	do....	4.217
Plate, bearing surface of rivets	do ...	2.415
Rivets, shearing area	do....	7.854

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
6,632	1,000	0.	0.	Initial load.
13,264	2,000	.0000	.....	
19,896	3,000	.0001	.....	
26,528	4,000	.0003	.....	
33,160	5,000	.0002	.0002	
39,792	6,000	.0001	.....	
46,424	7,000	.0021	.....	
53,056	8,000	.0040	.....	
59,688	9,000	.0047	.....	
66,320	10,000	.0062	.0056	
72,952	11,000	.0070	.....	
79,584	12,000	.0074	.....	
86,216	13,000	.0080	.....	
92,848	14,000	.0091	.....	
99,480	15,000	.0109	.0101	
106,112	16,000	.0127	.....	
112,744	17,000	.0136	.....	
119,376	18,000	.0148	.....	
126,008	19.000	.0161	.....	
132,640	20,000	.0176	.0147	
139,272	21,000	.0193	.....	
145,904	22,000	.0216	.....	
152,536	23,000	.0247	.....	
159,168	24,000	.0291	.....	
165,800	25,000	.0465	.0396	
172,432	26,000	.0638	.....	
179,064	27,000	.0781	.....	
185,696	28,000	.0948	.....	
192,328	29,000	.1135	.....	
198,960	30,000	.15	.....	
205,592	31,000	.18	.....	
212,224	32,000	.20	.....	
218,856	33,000	.21	.....	
225,488	34,000	.27	.....	
232,120	35,000	.30	.....	
238,752	36,000	.34	.....	
245,384	37,000	.41	.....	
252,016	38,000	.48	.....	
258,648	39,000	.56	.....	
265,280	40,000	.65	.....	
269,250	40,600	.77	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, lamellar. Open at edges ".12 and ".15.
Elongation of rivet-holes, ".84, ".84, ".79, ".75, ".78.
Area at fracture (one section), 1".55 × ".29=.4495 square inch.
Contraction, 46.8 per cent.

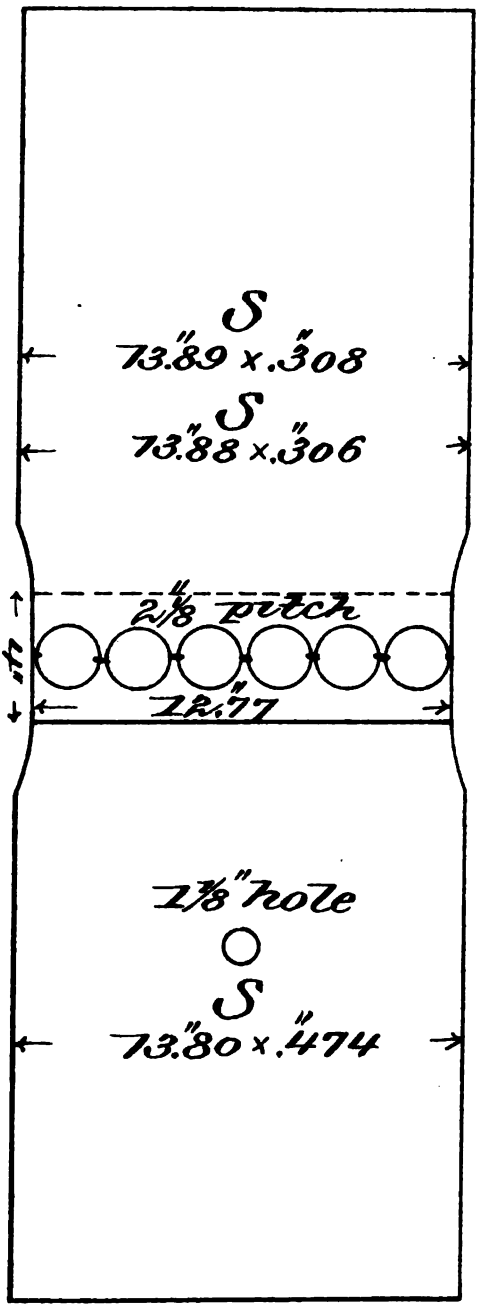
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	40,600
Tension on net section of plate	do....	63,860
Compression on bearing surface of rivets	do....	111,490
Shearing on rivets	do....	34,280

Efficiency of joint, 67.6 per cent.

No. 7426

½" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	6.053
Plate, net sectional area	do	2.853
Plate, bearing surface of rivets	do	3.200
Rivets, shearing area	do	11.928

[Tested at temperature of 300° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
212,300	35,070	.....	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, lamellar.
Area at fracture (one section), $''.89 \times ''.34 = .3026$ square inch.
Contraction, 36.1 per cent.
Elongation of rivet-holes, ″.28, ″.28, ″.28, ″.29, ″.29, ″.29.

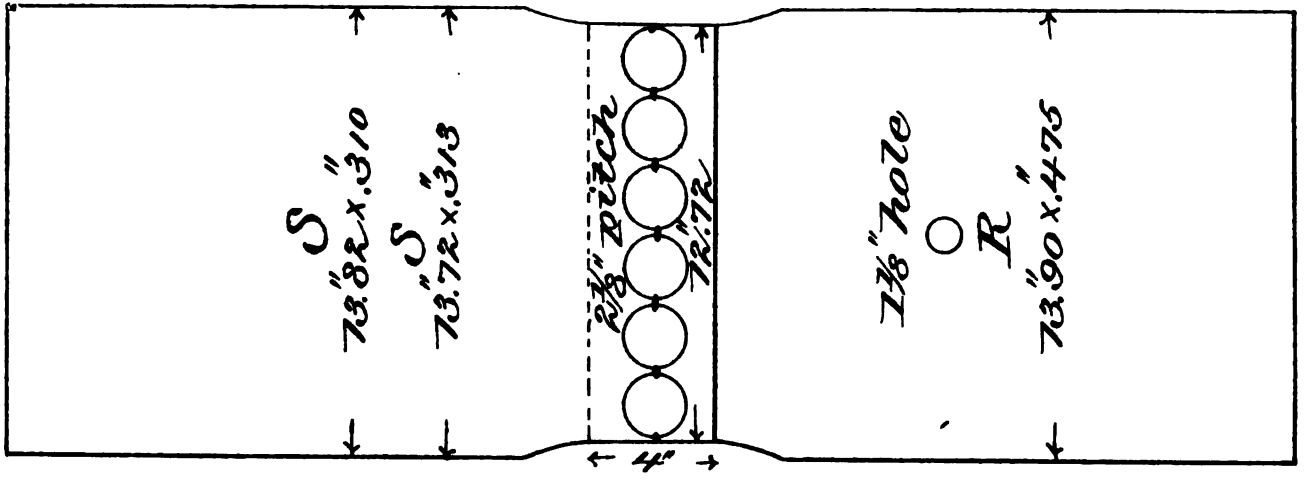
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	35,070
Tension on net section of plate	do	74,410
Compression on bearing surface of rivets	do	66,340
Shearing on rivets	do	18,630

Efficiency of joint, 50.3 per cent.

No. 7427

½" steel plate



H Ex 3/ 49 2

Areas.

Plate, gross sectional area	square inches..	6.042
Plate, net sectional area	do....	2.836
Plate, bearing surface of rivets	do....	3.206
Rivets, shearing area	do....	11.928

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
6,042	1,000	0.	0.	Initial load.
12,084	2,000	.0000	.....	
18,126	3,000	.0001	.....	
24,168	4,000	.0003	.....	
30,210	5,000	.0006	.0004	
36,252	6,000	.0013	.....	
42,294	7,000	.0032	.....	
48,336	8,000	.0042	.....	
54,378	9,000	.0053	.....	
60,420	10,000	.0065	.0057	
66,462	11,000	.0086	.....	
72,504	12,000	.0102	.....	
78,546	13,000	.0114	.....	
84,588	14,000	.0126	.....	
90,630	15,000	.0135	.0112	
96,672	16,000	.0150	.....	
102,714	17,000	.0162	.....	
108,756	18,000	.0179	.....	
114,798	19,000	.0201	.....	
120,840	20,000	.0247	.0200	
126,882	21,000	.0282	.....	
132,924	22,000	.0316	.....	
138,966	23,000	.0402	.....	
145,008	24,000	.0485	.....	
151,050	25,000	.0596	.0517	
157,092	26,000	.0732	.....	
163,134	27,000	.0865	.....	
169,176	28,000	.1050	.....	
175,218	29,000	.14	.....	
181,260	30,000	.18	.....	
183,800	30,420	.....	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slightly lamellar. Open at edges ".10 and ".08.
Elongation of rivet-holes, ".41, ".42, ".42, ".42, ".42, ".42.
Area at fracture (one section), ".83 × ".29 = .2407 square inch.
Contraction, 49.3 per cent.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	30,420
Tension on net section of plate	do....	64,810
Compression on bearing surface of rivets	do....	57,330
Shearing on rivets	do....	15,410

Efficiency of joint, 51.5 per cent.

No. 7428

½" steel plate.

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	6.471
Plate, net sectional area	do	3.238
Plate, bearing surface of rivets	do	3.233
Rivets, shearing area	do	11.928

[Tested at temperature of 350° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
261,000	40,330	.....	.....	Tensile strength.

Fractured plate along line of riveting.

Appearance, silky, lamellar; surfaces irregular in part, and making angle of 50° with rolled surface of plate in part.

Area at fracture (one section), 1″.03×″.39=.4017 square inch.

Contraction, 25.4 per cent.

Open at edges ″.02 and ″.01.

Elongation of rivet-holes, ″.30, ″.29, ″.27, ″.30, ″.31.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	40,330
Tension on net section of plate	do	80,620
Compression on bearing surface of rivets	do	80,730
Shearing on rivets	do	21,880

Efficiency of joint, 67.2 per cent.

No. 7429

½" steel plate

H Ex 31 ... 49 2

Areas.

Plate, gross sectional area	square inches..	6.278
Plate, net sectional area	do....	3.139
Plate, bearing surface of rivets	do....	3.136
Rivets, shearing area	do....	11.928

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
6,278	1,000	0.	0.	Initial load.
12,556	2,000	—.0001	.....	
18,834	3,000	—.0001	.....	
25,112	4,000	—.0001	—.0001	
31,390	5,000	—.0002	.....	
37,668	6,000	.0000	.....	
43,946	7,000	.0007	.....	
50,204	8,000	.0027	.....	
56,502	9,000	.0042	.....	
62,780	10,000	.0057	.0053	
69,058	11,000	.0070	.....	
75,336	12,000	.0075	.....	
81,614	13,000	.0080	.....	
87,892	14,000	.0087	.....	
94,170	15,000	.0097	.0093	
100,448	16,000	.0112	.....	
106,726	17,000	.0120	.....	
113,004	18,000	.0132	.....	
119,282	19,000	.0148	.....	
125,560	20,000	.0165	.0145	Rested 15 hours.
131,838	21,000	.0175	.....	
138,116	22,000	.0194	.....	
144,394	23,000	.0243	.....	
150,672	24,000	.0285	.....	
156,950	25,000	.0340	.0289	
163,228	26,000	.0440	.....	
169,506	27,000	.0550	.....	
175,784	28,000	.0680	.....	
182,062	29,000	.0825	.....	
188,340	30,000	.0995	.....	
194,618	31,000	.1220	.....	
200,896	32,000	.16	.....	
207,174	33,000	.20	.....	
209,800	33,420	.....	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slightly lamellar. Open at edges ".10 and ".08.
Elongation of rivet-holes, ".50, ".49, ".46, ".46, ".45, ".45.
Area at fracture (one section), ".93×".28=.2604 square inch.
Contraction, 50.2 per cent.

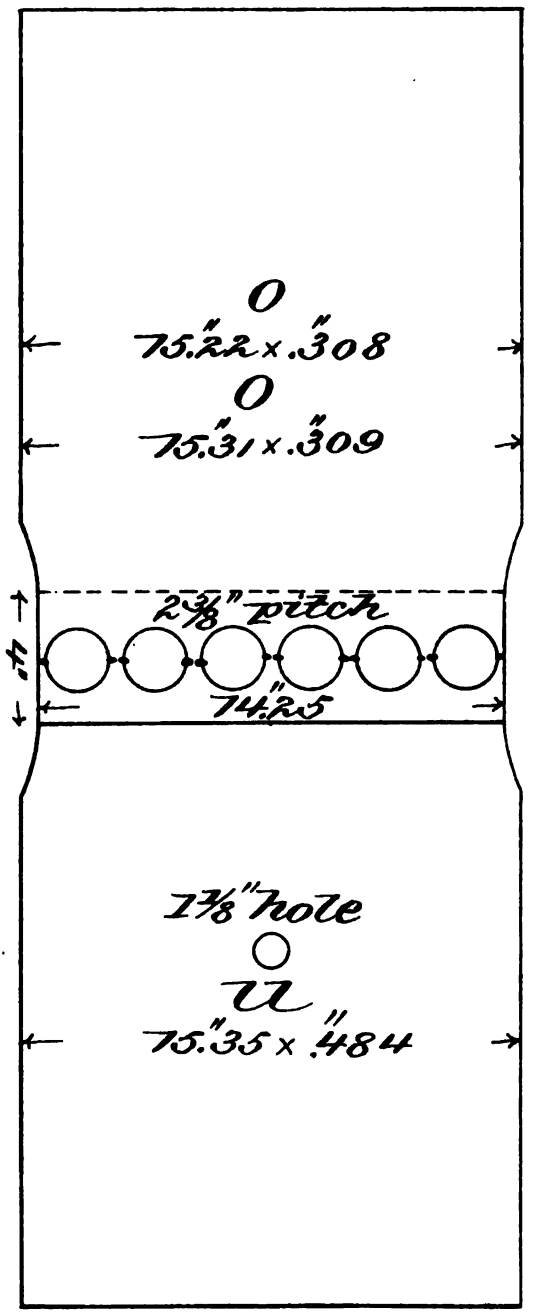
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	33,420
Tension on net section of plate	do....	66,840
Compression on bearing surface of rivets	do....	66,840
Shearing on rivets	do....	17,590

Efficiency of joint, 56.5 per cent.

No. 7430

½" Steel Plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	6.897
Plate, net sectional area	do....	3.620
Plate, bearing surface of rivets	do....	3.277
Rivets, shearing area of rivets	do....	11.928

[Tested at a temperature above that required to boil sperm oil, or probably about 700° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds. 251,000	*Pounds.* 36,390	*Inch.*	*Inch.*	Tensile strength.

Fractured plate along line of riveting, with medium loud report.

The fractured surfaces were smooth and oblique to the flat surfaces of the plate, making with it an angle of 47° to 48°, except the end sections, which had irregular surfaces.

The color of the edges of the joint was a dark blue-black when the testing was done.

After fracture the broken surfaces of the end sections were medium dark blue; the inner sections were varied from dark blue to dark straw color; a small part of the middle section remained uncolored.

Elongation of rivet-holes, ″.39, ″.38, ″.39, ″.39, ″.41, ″.46.

Area at fracture (one section), 1″.12×″.38=.4256 square inch.

Contraction, 29.6 per cent.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	36,900
Tension on net section of plate	do....	65,150
Compression on bearing surface of rivets	do....	76,594
Shearing on rivets	do....	21,040

Efficiency of joint, 62.7 per cent.

No. 74131

½" Steel Plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inch..	6.892
Plate, net sectional area	do....	3.632
Plate, bearing surface of rivets	do....	3.200
Rivets, shearing area	do....	11.928

Applied loads.		In ganged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
6,892	1,000	0.	0.	Initial load.
13,784	2,000	.0000	.....	
20,676	3,000	.0001	.....	
27,568	4,000	.0004	.....	
34,460	5,000	.0008	.0005	
41,352	6,000	.0022	.....	
48,244	7,000	.0050	.....	
55,136	8,000	.0060	.....	
62,028	9,000	.0071	.....	
68,920	10,000	.0081	.0069	
75,812	11,000	.0096	.....	
82,704	12,000	.0107	.....	
89,596	13,000	.0120	.....	
96,488	14,000	.0129	.....	
103,380	15,000	.0142	.0117	
110,272	16,000	.0155	.....	
117,164	17,000	.0171	.....	
124,056	18,000	.0185	.....	
130,948	19,000	.0195	.....	
137,840	20,000	.0225	.0180	
144,732	21,000	.0270	.....	
151,624	22,000	.0309	.....	
158,516	23,000	.0375	.....	
165,408	24,000	.0473	.....	
172,300	25,000	.0562	.0486	
179,192	26,000	.0685	.....	
186,084	27,000	.0798	.....	
192,976	28,000	.0935	.....	
199,868	29,000	.1135	.....	
206,760	30,000	.1370	.1265	
213,652	31,000	.17	.....	
220,544	32,000	.22	.....	
227,436	33,000	.27	.....	
232,000	33,660	.37	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, lamellar. Open at edges ″.15 and ″.03.
Elongation of rivet-holes, ″.56, ″.53, ″.53, ″.53, ″.53, ″.55.
Area at fracture (one section), 1″.02×″.27=.2754 square inch.
Contraction, 54.3 per cent.

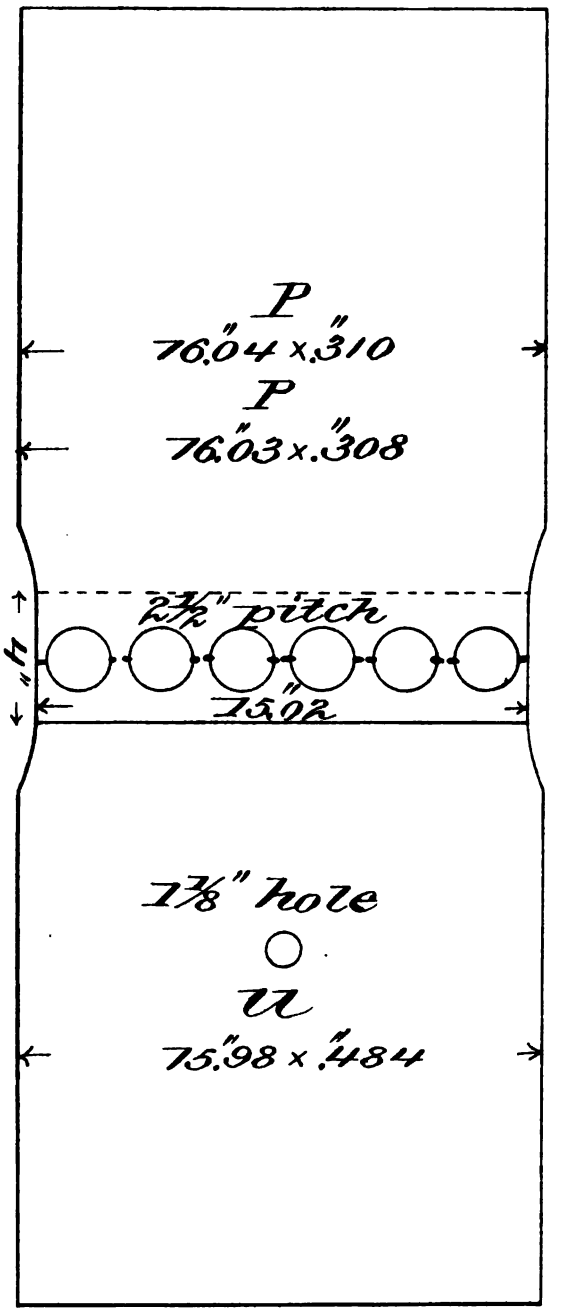
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	33,660
Tension on net section of plate	do....	63,870
Compression on bearing surface of rivets	do....	71,160
Shearing on rivets	do....	19,450

Efficiency of joint, 58.0 per cent.

No 74132

½" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	7.270
Plate, net sectional area	do....	4.043
Plate, bearing surface of rivets	do....	3.227
Rivets, shearing area	do....	11.938

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
7,270	1,000	0.	0.	Initial load.
14,540	2,000	.0004	.....	
21,810	3,000	.0008	.....	
29,080	4,000	.0019	.....	
36,350	5,000	.0040	.0028	
43,620	6,000	.0052	.....	
50,890	7,000	.0071	.....	
58,160	8,000	.0085	.....	
65,430	9,000	.0098	.....	
72,700	10,000	.0110	.0083	
79,970	11,000	.0124	.....	
87,240	12,000	.0137	.....	
94,510	13,000	.0155	.....	
101,780	14,000	.0162	.....	
109,050	15,000	.0182	.0130	
116,320	16,000	.0195	.....	
123,590	17,000	.0204	.....	
130,860	18,000	.0218	.....	
138,130	19,000	.0228	.....	
145,400	20,000	.0243	.0173	
152,670	21,000	.0270	.....	
159,940	22,000	.0298	.....	
167,210	23,000	.0335	.....	
174,480	24,000	.0413	.....	
181,750	25,000	.0519	.0425	
189,020	26,000	.0640	.....	
196,290	27,000	.0740	.....	
203,560	28,000	.0844	.....	
210,830	29,000	.1080	.....	
218,100	30,000	.1285	.1160	
225,370	31,000	.14	.....	
232,640	32,000	.18	.....	
239,910	33,000	.21	.....	
247,180	34,000	.26	.....	
254,450	35,000	.30	.....	
261,720	36,000	.40	.....	
262,800	36,140	.46	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky. Open at edges ″.05 and ″.12.
Elongation of rivet-holes, ″.62, ″.55, ″.56, ″.56, ″.56, ″.59.
Area at fracture (one section), 1″.16×″.30=.3480 square inch.
Contraction, 47.7 per cent.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	36,140
Tension on net section of plate	do....	65,000
Compression on bearing surface of rivets	do....	81,430
Shearing on rivets	do....	22,030

Efficiency of joint, 62.3 per cent.

No. 7433

½" steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	7.215
Plate, net sectional area	do....	3.968
Plate, bearing surface of rivets	do....	3.247
Rivets, shearing area	do....	11.928

[Tested at temperature of 500° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds 321,600	*Pounds.* 44,490	*Inch.*	*Inch.*	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, oblique 50°. Open at edges ″.04 and 0.
Area at fracture (one section), 1″.25 × ″.38 = .475 square inch.
Contraction, 28.1 per cent.
Elongation of rivet-holes, ″.44, ″.39, ″.39, ″.40, ″.45, ″.48.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	44,490
Tension on net section of plate	do....	61,050
Compression on bearing surface of rivets	do....	99,040
Shearing area of rivets	do....	26,960

Efficiency of joint, 76.7 per cent.

No. 74314

½" steel plate

H Ex 91 49 2

Areas.

Plate, gross sectional area	square inches	6.193
Plate, net sectional area	do	3.538
Plate, bearing surface of rivets	do	2.655
Rivets, shearing area of rivets	do	9.940

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
6,193	1,000	0.	0.	Initial load.
12,386	2,000	.0002	.....	
18,579	3,000	.0004	.....	
24,772	4,000	.0005	.....	
30,965	5,000	.0008	.0007	
37,158	6,000	.0015	.....	
43,351	7,000	.0037	.....	
49,544	8,000	.0053	.....	
55,737	9,000	.0063	.....	
61,930	10,000	.0074	.0070	
68,123	11,000	.0098	.....	
74,316	12,000	.0105	.....	
80,509	13,000	.0110	.....	
86,702	14,000	.0123	.....	
92,895	15,000	.0138	.0127	
99,088	16,000	.0152	.....	
105,281	17,000	.0160	.....	
111,474	18,000	.0172	.....	
117,667	19,000	.0185	.....	
123,860	20,000	.0193	.0165	
130,053	21,000	.0205	.....	
136,246	22,000	.0270	.....	
142,439	23,000	.0325	.....	
148,632	24,000	.0420	.....	
154,825	25,000	.0520	.0463	
161,018	26,000	.0652	.....	
167,211	27,000	.0780	.....	
173,404	28,000	.0925	.....	
179,597	29,000	.1115	.....	
185,790	30,000	.1325	.1217	
191,983	31,000	.17	.....	
198,176	32,000	.19	.....	
204,369	33,000	.24	.....	Sustained this load ½ minute, then released to zero and allowed to rest 2 hours; then loads applied and the joint ruptured.
227,100	36,670	.....	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, lamellar. Open at edges ″.15 each.
Elongation of rivet-holes, ″.64, ″.59, ″.59, ″.63, ″.69.
Area at fracture (one section), 1″.27 × ″.29 = .3683 square inch.
Contraction, 47.9 per cent.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	36,670
Tension on net section of plate	do	64,190
Compression on bearing surface of rivets	do	85,540
Shearing on rivets	do	22,850

Efficiency of joint, 62.0 per cent.

No. 7435

½" steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	6.232
Plate, net sectional area	do....	3.560
Plate, bearing surface of rivets	do....	2.672
Rivets, shearing area	do....	2.940

Applied loads.		In ganged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
6,232	1,000	0.	0.	Initial load.
12,464	2,000	.0003	.....	
18,696	3,000	.0006	.....	
24,928	4,000	.0007	.....	
31,160	5,000	.0006	.0004	
37,392	6,000	.0016	.....	
43,624	7,000	.0037	.....	
49,856	8,000	.0043	.....	
56,088	9,000	.0056	.....	
62,320	10,000	.0069	.0058	
68,552	11,000	.0096	.....	
74,784	12,000	.0112	.....	
81,016	13,000	.0121	.....	
87,248	14,000	.0126	.....	
93,480	15,000	.0136	.0101	
99,712	16,000	.0145	.....	
105,944	17,000	.0153	.....	
112,176	18,000	.0165	.....	
118,408	19,000	.0181	.....	
124,640	20,000	.0211	.0164	
130,872	21,000	.0258	.....	
137,104	22,000	.0295	.....	
143,336	23,000	.0333	.....	
149,568	24,000	.0386	.....	
155,800	25,000	.0476	.0404	
162,032	26,000	.0586	.....	
168,264	27,000	.0722	.....	
174,496	28,000	.0896	.....	
180,728	29,000	.1080	.....	
186,960	30,000	.1330	.....	
193,192	31,000	.15	.....	
199,424	32,000	.17	.....	
205,656	33,000	.22	.....	
211,888	34,000	.26	.....	
218,120	35,000	.30	.....	
224,352	36,000	.38	.....	
225,580	36,200	.45	.....	Tensile strength.
211,000	.....	.....	.....	Load at time of fracture.

Fractured plate along line of riveting.
Appearance, silky, lamellar. Open at edges ″.08 each.
Elongation of rivet-holes, ″.61, ″.58, ″.56, ″.55, ″.59.
Area at fracture (one section), 1″.28×″.28=.3584 square inch.
Contraction, 49.7 per cent.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	36,200
Tension on net section of plate	do....	63,370
Compression on bearing surface of rivets	do....	84,420
Shearing on rivets	do....	22,690

Efficiency of joint, 61.2 per cent.

No. 7436

½" steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	6.632
Plate, net sectional area	do....	3.921
Plate, bearing surface of rivets	do....	2.711
Rivets, shearing area	do....	9.040

[Tested at temperature of 600° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds. 280, 800	*Pounds.* 42, 340	*Inch.*	*Inch.*	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky; resembles shearing fractures. Oblique, 50°.
Area at fracture (one section), 1″.52×″.39=.5928 square inch.
Contraction, 24.3 per cent. Open at edges, ″.05 and ″.07.
Elongation of rivet-holes, ″.55, ″.49, ″.49, ″.51, ″.61.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	42, 340
Tension on net section of plate	do....	71, 610
Compression on bearing surface of rivets	do....	103, 580
Shearing on rivets	do....	28, 250

Efficiency of joint, 70.5 per cent.

No. 7437

½" steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	6.632
Plate, net sectional area	do....	3.921
Plate, bearing surface of rivets	do....	2.711
Rivets, shearing area	do....	9.940

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
6,632	1,000	0.	0.	Initial load.
13,264	2,000	.0002	.....	
19,896	3,000	.0005	.....	
26,528	4,000	.0007	.....	
33,160	5,000	.0015	.0013	
39,792	6,000	.0030	.....	
46,424	7,000	.0050	.....	
53,056	8,000	.0060	.....	
59,688	9,000	.0070	.....	
66,320	10,000	.0082	.0065	
72,952	11,000	.0100	.....	
79,584	12,000	.0114	.....	
86,216	13,000	.0125	.....	
92,848	14,000	.0135	.....	
99,480	15,000	.0150	.0115	
106,112	16,000	.0176	.....	
112,744	17,000	.0190	.....	
119,376	18,000	.0205	.....	
126,008	19,000	.0220	.....	
132,640	20,000	.0237	.0183	
139,272	21,000	.0273	.....	
145,904	22,000	.0297	.....	
152,536	23,000	.0328	.....	
159,168	24,000	.0415	.....	
165,800	25,000	.0518	.0438	
172,432	26,000	.0666	.....	
179,064	27,000	.0813	.....	
185,696	28,000	.09	.....	
192,328	29,000	.11	.....	
198,960	30,000	.14	.....	
205,592	31,000	.17	.....	
212,224	32,000	.18	.....	
218,856	33,000	.20	.....	
225,488	34,000	.25	.....	
232,120	35,000	.29	.....	
238,752	36,000	.35	.....	
245,384	37,000	.41	.....	
252,016	38,000	.48	.....	
256,800	38,720	.....	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky. Open at edges ".25 and ".10.
Elongation of rivet-holes, ".78, ".72, ".70, ".70, ".72.
Area at fracture (one section), 1".42 × ".30 = .4260 square inch
Contraction, 45.6 per cent.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	38,720
Tension on net section of plate	do....	65,440
Compression on bearing surface of rivets	do....	94,730
Shearing on rivets	do....	25,840

Efficiency of joint, 64.5 per cent.

No. 7438

½" steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	6.965
Plate, net sectional area	do	4.243
Plate, bearing surface of rivets	do	2.722
Rivets, shearing area	do	9.940

[Tested at a temperature of 500° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
324,800	46,630	.....	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slightly lamellar. Oblique fractures, 50°.
Area at fracture (one section), 1″.57 × ″.37 = .5809 square inch.
Contraction, 31.4 per cent. Open at edges ″.03 and 0.
Elongation of rivet-holes, ″.69, ″.62, ″.58, ″.56, ″.59.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	46,630
Tension on net section of plate	do	76,550
Compression on bearing surface of rivets	do	119,320
Shearing on rivets	do	32,680

Efficiency of joint, 80.3 per cent.

No. 7439

½" steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	6.974
Plate, net sectional area	do....	4.246
Plate, bearing surface of rivets	do....	2.728
Rivets, shearing area	do....	9.940

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
6,974	1,000	0.	0.	Initial load.
13,948	2,000	.0001	.....	
20,922	3,000	.0002	.....	
27,896	4,000	.0005	.....	
34,870	5,000	.0023	.0016	
41,844	6,000	.0041	.....	
48,818	7,000	.0062	.....	
55,792	8,000	.0076	.....	
62,766	9,000	.0085	.....	
69,740	10,000	.0096	.0080	
76,714	11,000	.0111	.....	
83,688	12,000	.0126	.....	
90,662	13,000	.0141	.....	
97,636	14,000	.0161	.....	
104,610	15,000	.0176	.0144	
111,584	16,000	.0197	.....	
118,558	17,000	.0211	.....	
125,532	18,000	.0225	.....	
132,506	19,000	.0241	.....	
139,480	20,000	.0256	.0203	
146,454	21,000	.0286	.....	
153,428	22,000	.0301	.....	
160,402	23,000	.0327	.....	
167,376	24,000	.0401	.....	
174,350	25,000	.0574	.....	
181,324	26,000	.0698	.....	
188,298	27,000	.0850	.....	
195,272	28,000	.1025	.....	
202,246	29,000	.1225	.....	
209,220	30,000	.14	.....	
216,194	31,000	.16	.....	
223,168	32,000	.18	.....	
230,142	33,000	.23	.....	
237,116	34,000	.27	.....	
244,090	35,000	.33	.....	
251,064	36,000	.37	.....	
258,038	37,000	.45	.....	
265,012	38,000	.52	.....	
271,300	38,900	.....	.....	Tensile strength.

Fractured plate along line of riveting.

Appearance, silky, lamellar. Metal well drawn down. Open at edges ″.15 each.

Elongation of rivet-holes, ″.86, ″.78, ″.77, .″.77, ″.84.

Area at fracture (one section), 1″.50×″.29=.435 square inch.

Contraction, 48.7 per cent.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	38,900
Tension on net section of plate	do....	63,890
Compression on bearing surface of rivets	do....	99,450
Shearing on rivets	do....	27,290

Efficiency of joint, 67.0 per cent.

No. 74440

½" steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	7.23
Plate, net sectional area	do....	4.510
Plate, bearing surface of rivets	do....	2.719
Rivets, shearing area	do....	9.941

[Tested at temperature of 200° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds. 283,300	*Pounds.* 39,180	*Inch.*	*Inch.*	Tensile strength.

Fractured plate along line of riveting.

Appearance, silky, lamellar. Open at edges ″.05 and ″.10; at fifth section ″.15.

Area at fracture (one section), 1″.67 × ″.32 = .5344 square inch.

Contraction, 40.8 per cent.

Elongation of rivet-holes, ″.66, ″.65, ″.70, ″.80, ″.95.

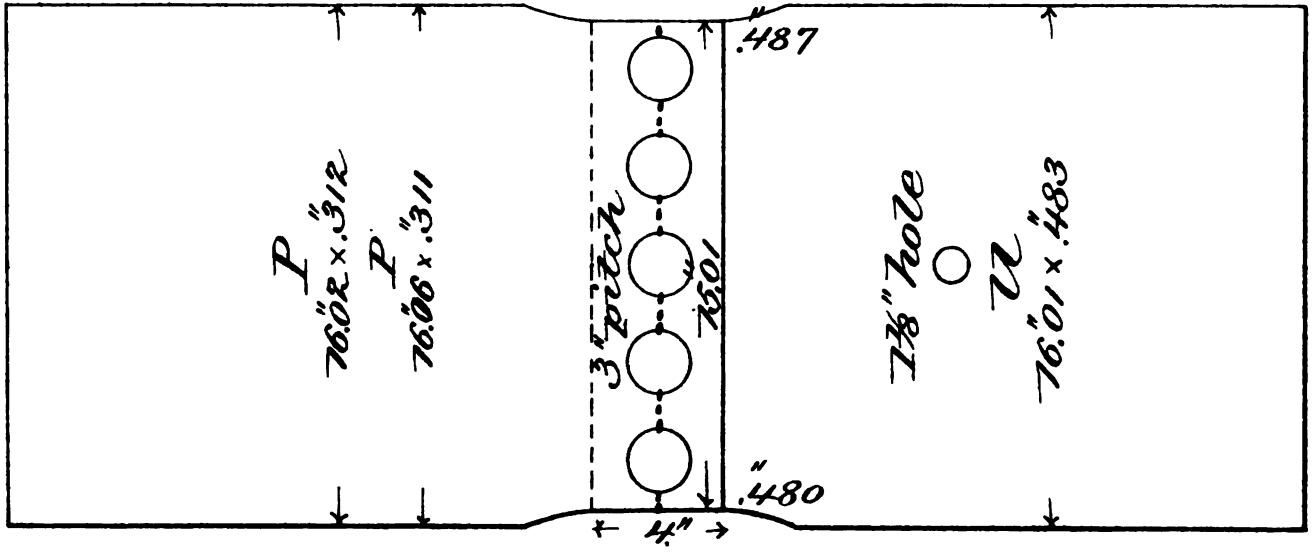
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	39,180
Tension on net section of plate	do....	62,690
Compression on bearing surface of rivets	do....	104,500
Shearing on rivets	do....	28,500

Efficiency of joint, 67.5 per cent.

No. 7441

½" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	7.250
Plate, net sectional area	do....	4.528
Plate, bearing surface of rivets	do....	2.722
Rivets, shearing area	do....	9.940

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
7,250	1,000	0.	0.	Initial load.
14,500	2,000	.0002	.....	
21,750	3,000	.0005	.....	
29,000	4,000	.0009	.....	
36,250	5,000	.0024	.0018	
43,500	6,000	.0044	.....	
50,750	7,000	.0069	.....	
58,000	8,000	.0090	.....	
65,250	9,000	.0113	.....	
72,500	10,000	.0126	.0118	
79,750	11,000	.0139	.....	
87,000	12,000	.0148	.....	
94,250	13,000	.0161	.....	
101,500	14,000	.0177	.....	
108,750	15,000	.0190	.0154	
116,000	16,000	.0208	.....	
123,250	17,000	.0220	.....	
130,500	18,000	.0230	.....	
137,750	19,000	.0245	.....	
145,000	20,000	.0260	.0203	
152,250	21,000	.0290	.....	
159,500	22,000	.0318	.....	
166,750	23,000	.0370	.....	
174,000	24,000	.0470	.....	
181,250	25,000	.0655	.0560	
188,500	26,000	.08	.....	
195,750	27,000	.10	.....	
203,000	28,000	.12	.....	
210,250	29,000	.13	.....	
217,500	30,000	.16	.....	
224,750	31,000	.18	.....	
232,000	32,000	.21	.....	
239,250	33,000	.23	.....	
246,500	34,000	.28	.....	
253,750	35,000	.33	.....	
261,000	36,000	.38	.....	
268,250	37,000	.45	.....	
275,500	38,000	.52	.....	
282,750	39,000	.60	.....	
290,000	40,000	.72	.....	
249,600	40,630	.90	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slight lamination. Open at edges ".20 and ".10.
Area at fracture (one section), 1".61 × ".30 = .4830 square inch.
Contraction, 46.6 per cent.
Elongation of rivet-holes, ".95, ".86, ".86, ".88, ".92.

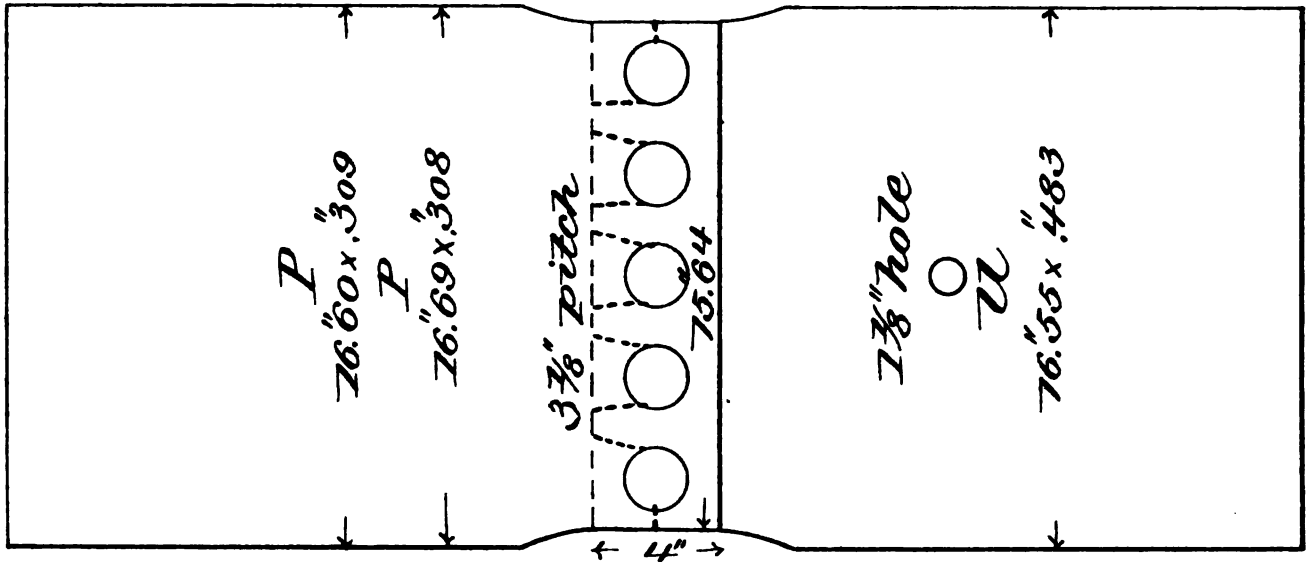
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	40,630
Tension on net section of plate	do....	65,000
Compression on bearing surface of rivets	do....	108,220
Shearing on rivets	do....	29,630

Efficiency of joint, 70.0 per cent.

No. 7442

½" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	7.554
Plate, net sectional area	do....	4.837
Plate, bearing surface of rivets	do....	2.717
Rivets, shearing area	do....	9.940

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
7,554	1,000	0.	0.	Initial load.
15,108	2,000	0.	.....	
22,662	3,000	.0002	.....	
30,216	4,000	.0007	.....	
37,770	5,000	.0026	.0021	
45,324	6,000	.0038	.....	
52,878	7,000	.0053	.....	
60,432	8,000	.0063	.....	
67,986	9,000	.0072	.....	
75,540	10,000	.0087	.0074	
83,094	11,000	.0107	.....	
90,648	12,000	.0119	.....	
98,202	13,000	.0140	.....	
105,756	14,000	.0153	.....	
113,310	15,000	.0159	.0121	
120,864	16,000	.0183	.....	
128,418	17,000	.0193	.....	
135,972	18,000	.0204	.....	
143,526	19,000	.0224	.....	
151,080	20,000	.0251	.0193	
158,634	21,000	.0278	.....	
166,188	22,000	.0304	.....	
173,742	23,000	.0347	.....	
181,296	24,000	.0433	.....	
188,850	25,000	.0651	.0553	
196,404	26,000	.0898	.....	
203,958	27,000	.1110	.....	
211,512	28,000	.13	.....	
219,066	29,000	.17	.....	
226,620	30,000	.20	.....	
234,174	31,000	.22	.....	
241,728	32,000	.27	.....	
249,282	33,000	.31	.....	
256,836	34,000	.38	.....	
264,390	35,000	.45	.....	
271,944	36,000	.55	.....	
279,498	37,000	.63	.....	
287,052	38,000	.80	.....	
292,400	38,570	.....	.....	Tensile strength.

Tore out plate in front of rivets. Shearing fractures, in part granular at one section.

Elongation of rivet-holes, 1″.07, 1″.15, 1″.05, 1″.14, ″.89.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	38,570
Tension on net section of plate	do....	60,450
Compression on bearing surface of rivets	do....	107,610
Shearing on rivets	do....	29,410

Efficiency of joint, 67.2 per cent.

No. 7443

½" steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	7.565
Plate, net sectional area	do....	4.843
Plate, bearing surface of rivets	do....	2.722
Rivets, shearing area	do....	9.940

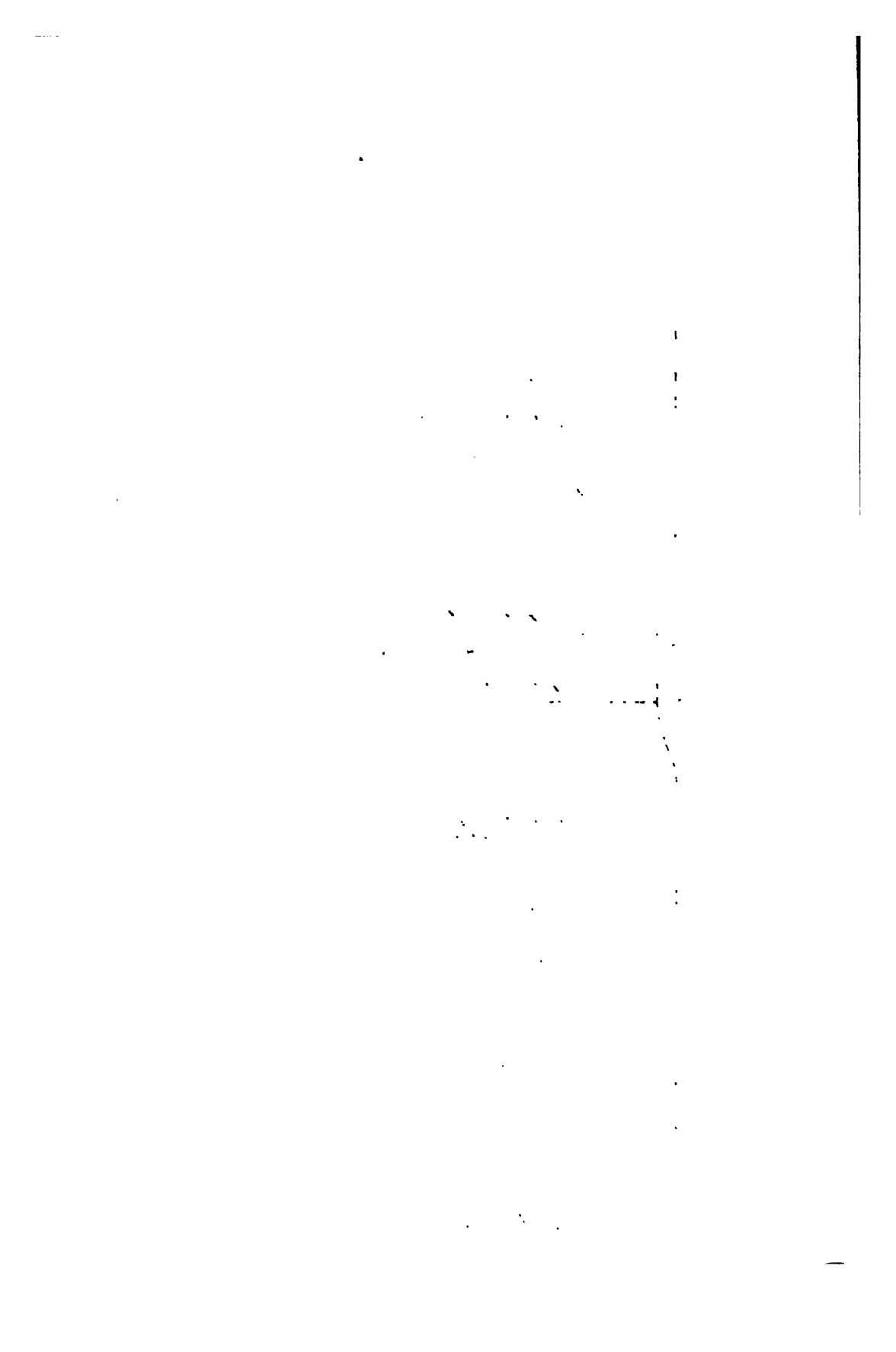
Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
7,565	1,000	0.	0.	Initial load.
15,130	2,000	.0003	.....	
22,695	3,000	.0005	.....	
30,260	4,000	.0007	.....	
37,825	5,000	.0014	.0010	
45,390	6,000	.0022	.....	
52,955	7,000	.0030	.....	
60,520	8,000	.0040	.....	
68,085	9,000	.0049	.....	
75,650	10,000	.0062	.0043	
83,215	11,000	.0079	.....	
90,780	12,000	.0089	.....	
98,345	13,000	.0106	.....	
105,910	14,000	.0116	.....	
113,475	15,000	.0132	.0103	
121,040	16,000	.0150	.....	
128,605	17,000	.0172	.....	
136,170	18,000	.0187	.....	
143,735	19,000	.0204	.....	
151,300	20,000	.0225	.0173	
158,865	21,000	.0262	.....	
166,430	22,000	.0291	.....	
173,995	23,000	.0331	.....	
181,560	24,000	.0402	.....	
189,125	25,000	.0617	.0572	
196,690	26,000	.0875	.....	
204,255	27,000	.1059	.....	
211,820	28,000	.1292	.....	
219,385	29,000	.16	.....	
226,950	30,000	.18	.....	
234,515	31,000	.21	.....	
242,080	32,000	.26	.....	
249,645	33,000	.30	.....	
257,210	34,000	.37	.....	
264,775	35,000	.43	.....	
272,340	36,000	.51	.....	
279,905	37,000	.61	.....	
287,470	38,000	.75	.....	
295,035	39,000	.98	.....	
296,250	39,160	1.10	.....	Tensile strength.

Tore plate out in front of rivets. Shearing fractures, in part granular at one section.

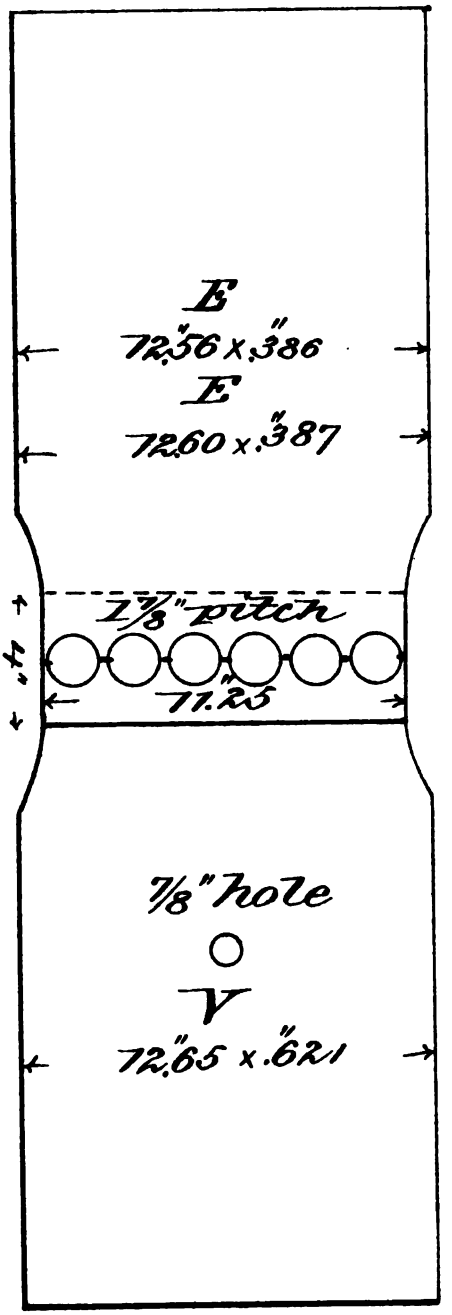
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	39,160
Tension on net section of plate	do....	61,170
Compression on bearing surface of rivets	do....	108,330
Shearing on rivets	do....	29,800

Efficiency of joint, 68.2 per cent.



No. 74414



⅝" steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	6.986
Plate, net sectional area	do....	3.726
Plate, bearing surface of rivets	do....	3.260
Rivets, shearing area	do....	7.216

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
6,986	1,000	0.	0.	Initial load.
13,972	2,000	.0002	.....	
20,958	3,000	.0005	.....	
27,944	4,000	.0009	.....	
34,930	5,000	.0013	.0011	
41,916	6,000	.0051	.....	
48,902	7,000	.0065	.....	
55,888	8,000	.0074	.....	
62,874	9,000	.0081	.....	
69,860	10,000	.0089	.0067	
76,846	11,000	.0105	.....	
83,832	12,000	.0122	.....	
90,818	13,000	.0131	.....	
97,804	14,000	.0145	.....	
104,790	15,000	.0165	.0123	
111,776	16,000	.0186	.....	
118,762	17,000	.0210	.....	
125,748	18,000	.0228	.....	
132,734	19,000	.0247	.....	
139,720	20,000	.0275	.0198	
146,706	21,000	.0307	.....	
153,692	22,000	.0338	.....	
160,678	23,000	.0398	.....	
167,664	24,000	.0510	.....	
174,650	25,000	.0625	.0525	
181,636	26,000	.0751	.....	
188,622	27,000	.0887	.....	
195,608	28,000	.1038	.....	
202,594	29,000	.115	.....	
209,580	30,000	.13	.....	
216,566	31,000	.17	.....	
223,552	32,000	.20	.....	
230,538	33,000	.26	.....	
235,800	33,750	.35	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, lamellar. Open at edges ″.15 each.
Elongation of rivet-holes, ″.49, ″.52, ″.48, ″.50, ″.52, ″.55.
Area at fracture (one section), ″.78×″.37=.2886 square inch.
Contraction, 53.5 per cent.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	33,750
Tension on net section of plate	do....	63,280
Compression on bearing surface of rivets	do....	72,330
Shearing on rivets	do....	32,670

Efficiency of joint, 60.1 per cent.

No. 7445

5/8" steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	7.020
Plate, net sectional area	do....	3.744
Plate, bearing surface of rivets	do....	3.276
Rivets, shearing area	do....	7.216

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
7,020	1,000	0.	0.	Initial load.
14,040	2,000	.0004	.....	
21,060	3,000	.0007	.....	
28,000	4,000	.0009	.....	
35,100	5,000	.0012	.0001	
42,120	6,000	.0012	.....	
49,140	7,000	.0017	.....	
56,160	8,000	.0022	.....	
63,180	9,000	.0036	.....	
70,200	10,000	.0048	.0023	
77,220	11,000	.0058	.....	
84,240	12,000	.0067	.....	
91,260	13,000	.0077	.....	
98,280	14,000	.0088	.....	
105,300	15,000	.0098	.0055	
112,320	16,000	.0109	.....	
119,340	17,000	.0122	.....	
126,360	18,000	.0134	.....	
133,380	19,000	.0150	.....	
140,400	20,000	.0168	.0108	
147,420	21,000	.0203	.....	
154,440	22,000	.0244	.....	
161,460	23,000	.0298	.....	
168,480	24,000	.0382	.....	
175,500	25,000	.0488	.0398	
182,520	26,000	.0623	.....	
189,540	27,000	.0758	.....	
196,560	28,000	.0908	.....	
203,580	29,000	.1084	.....	
210,600	30,000	.13	.....	Scale starts off plate.
217,620	31,000	.16	.....	
224,640	32,000	.19	.....	
231,660	33,000	.24	.....	
238,680	34,000	.30	.....	
242,400	34,530	.40	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, lamellar. Open at edges ".12 and ".10.
Elongation of rivet-holes, ".49, ".49, ".46, ".46, ".46, ".47.
Area at fracture (one section), ".78×".39=.3042 square inch.
Contraction, 51.2 per cent.

Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	34,530
Tension on net section of plate	do....	64,740
Compression on bearing surface of rivets	do....	74,000
Shearing on rivets	do....	33,590

Efficiency of joint, 62.7 per cent.

No. 74446

5/8" steel plate

H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	7.392
Plate, net sectional area	do....	4.158
Plate, bearing surface of rivets	do....	3.234
Rivets, shearing area	do....	7.216

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
7,392	1,000	0.	0.	Initial load.
14,784	2,000	.0002	.....	
22,176	3,000	.0005	.....	
29,568	4,000	.0007	.....	
36,960	5,000	.0012	.0007	
44,352	6,000	.0037	.....	
51,744	7,000	.0047	.....	
59,136	8,000	.0054	.....	
66,528	9,000	.0062	.....	
73,920	10,000	.0072	.0052	
81,312	11,000	.0081	.....	
88,704	12,000	.0096	.....	
96,096	13,000	.0113	.....	
103,488	14,000	.0131	.....	
110,880	15,000	.0143	.0102	
118,272	16,000	.0170	.....	
125,664	17,000	.0196	.....	
133,056	18,000	.0222	.....	
140,448	19,000	.0244	.....	
147,840	20,000	.0262	.0187	
155,232	21,000	.0277	.....	
162,624	22,000	.0292	.....	
170,016	23,000	.0307	.....	
177,408	24,000	.0342	.....	
184,800	25,000	.0448	.0357	
192,192	26,000	.0585	.....	
199,584	27,000	.0692	.....	
206,976	28,000	.0820	.....	
214,368	29,000	.0935	.....	
221,760	30,000	.1140	.....	
229,152	31,000	.135	.....	
236,544	32,000	.17	.....	
243,936	33,000	.20	.....	
251,328	34,000	.22	.....	
258,720	35,000	.27	.....	
266,112	36,000	.36	.....	
271,700	36,760	.43	.....	Tensile strength.

Sheared three rivets and fractured the plate along line of riveting across three sections.

Appearance, silky, lamellar.

Area at fracture (one section), $''.93 \times ''.39 = .3627$ square inch.

Contraction, 47.6 per cent.

Elongation of rivet-holes ($''.21$, $''.27$, $''.31$ sheared rivets in these holes), $''.62$, $''.49$, $''.43$.

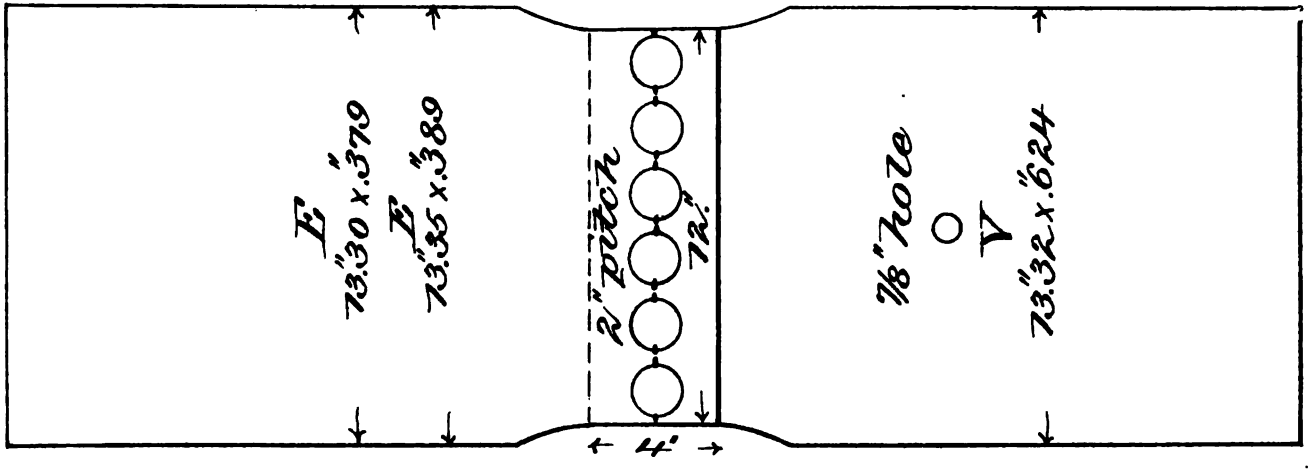
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	36,760
Tension on net section of plate	do....	65,340
Compression on bearing surface of rivets	do....	84,010
Shearing on rivets	do....	37,650

Efficiency of joint, 66.0 per cent.

No. 7447

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	7.488
Plate, net sectional area	do....	4.212
Plate, bearing surface of rivets	do....	3.276
Rivets, shearing area	do....	7.216

Applied loads.		In ganged length.		Remarks
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
7,488	1,000	.0	.0	Initial load.
14,976	2,000	.0001	.....	
22,464	3,000	.0002	.....	
29,952	4,000	.0002	.....	
37,440	5,000	.0002	.0000	
44,928	6,000	.0004	.....	
52,416	7,000	.0028	.....	
59,904	8,000	.0043	.....	
67,392	9,000	.0049	.....	
74,880	10,000	.0056	.0049	
82,368	11,000	.0066	.....	
89,856	12,000	.0074	.....	
97,344	13,000	.0086	.....	
104,832	14,000	.0097	.....	
112,320	15,000	.0113	.0095	
119,808	16,000	.0127	.....	
127,296	17,000	.0138	.....	
134,784	18,000	.0148	.....	
142,272	19,000	.0168	.....	
149,760	20,000	.0198	.0156	
157,248	21,000	.0238	.....	
164,736	22,000	.0275	.....	
172,224	23,000	.0378	.....	
179,712	24,000	.0483	.....	
187,200	25,000	.0584	.0513	
194,688	26,000	.0690	.....	
202,176	27,000	.0825	.....	
209,664	28,000	.0965	.....	
217,152	29,000	.1140	.....	
224,640	30,000	.1365	.....	
232,128	31,000	.17	.....	
239,616	32,000	.21	.....	
247,104	33,000	.24	.....	
254,592	34,000	.28	.....	
262,080	35,000	.37	.....	
263,000	35,120	.39	.....	Tensile strength.

Fractured plate along line of riveting.

Appearance, silky, exceedingly lamellar. Open at edges ".20 and ".17.

Elongation of rivet-holes, ".52, ".52, ".49, ".49, ".52, ".53.

Area at fracture (one section), ".95×".41=.3895 square inch.

Contraction, 44.5 per cent.

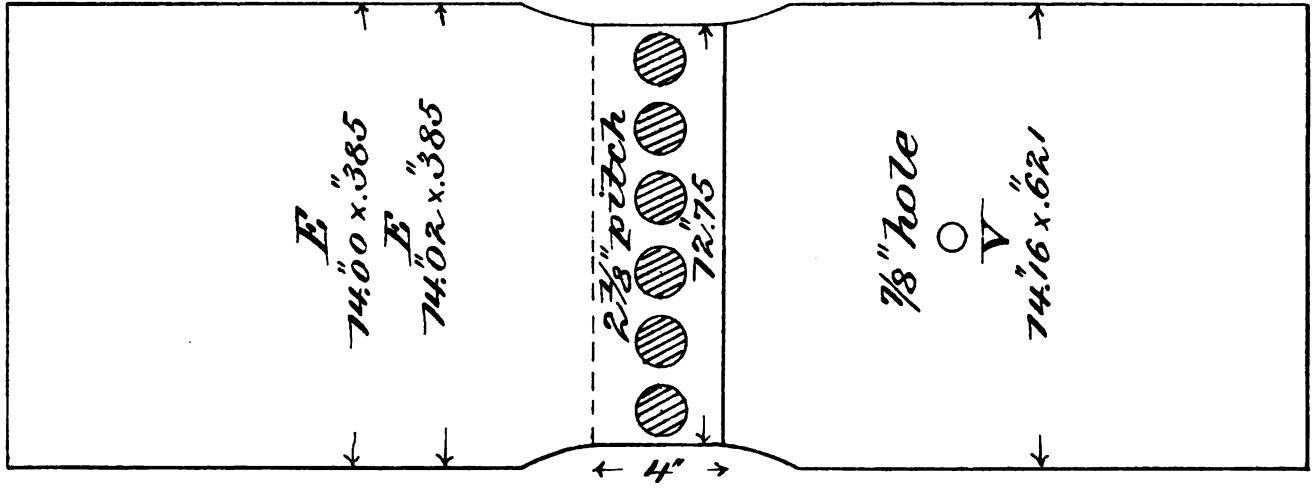
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	35,120
Tension on net section of plate	do....	62,440
Compression on bearing surface of rivets	do....	80,280
Shearing on rivets	do....	36,440

Efficiency of joint, 63.8 per cent.

No. 7448

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	7.018
Plate, net sectional area	do....	4.658
Plate, bearing surface of rivets	do....	3.269
Rivets, shearing area	do....	7.216

[Tested at temperature of 300° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds. 332,000	*Pounds.* 41,930	*Inch.*	*Inch.*	Tensile strength.

Sheared the rivets.
Elongation of rivet-holes, ".13, ".13, ".13, ".13, ".13, ".18.

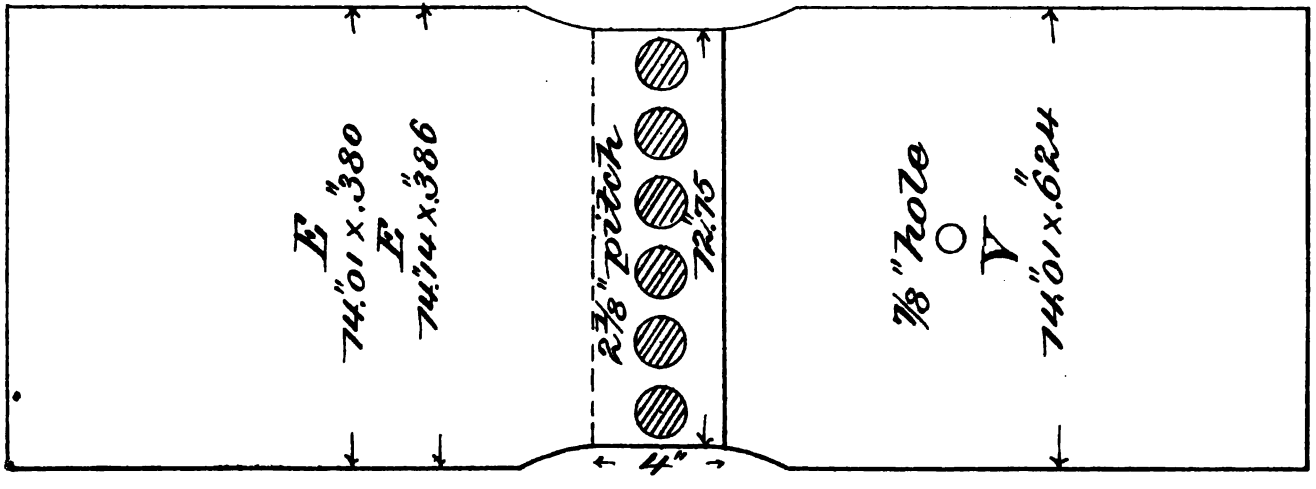
Maximum strength on joint.

Tension on gross section of plate	pounds per square inch..	41,930
Tension on net section of plate	do....	71,270
Compression on bearing surface of rivets	do....	101,840
Shearing on rivets	do....	46,010

Efficiency of joint, 76.2 per cent.

No. 7449

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	7.956
Plate, net sectional area	do....	4.680
Plate, bearing surface of rivets	do....	3.276
Rivets, shearing area	do....	7.216

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
7,956	1,000	0.	0.	Initial load.
15,912	2,000	0.	.....	
23,868	3,000	.0001	.....	
31,824	4,000	.0003	.....	
39,780	5,000	.0013	.0015	
47,736	6,000	.0023	.....	
55,692	7,000	.0031	.....	
63,648	8,000	.0036	.....	
71,604	9,000	.0042	.....	
79,560	10,000	.0050	.0048	
87,516	11,000	.0071	.....	
95,472	12,000	.0086	.....	
103,428	13,000	.0091	.....	
111,384	14,000	.0103	.....	
119,340	15,000	.0115	.0094	
127,296	16,000	.0136	.....	
135,252	17,000	.0154	.....	
143,208	18,000	.0184	.....	
151,164	19,000	.0214	.....	
159,120	20,000	.0258	.0204	
167,076	21,000	.0294	.....	
175,032	22,000	.0322	.....	
182,988	23,000	.0350	.....	
190,944	24,000	.0396	.....	
198,900	25,000	.0472	.0410	
206,856	26,000	.0583	.....	
214,812	27,000	.0692	.....	
222,768	28,000	.0825	.....	
230,724	29,000	.0974	.....	
238,680	30,000	.1160	.....	
246,636	31,000	.125	.....	
254,592	32,000	.16	.....	
262,548	33,000	.19	.....	
270,504	34,000	.22	.....	
278,460	35,000	.26	.....	
286,416	36,000	.31	.....	
292,800	36,800	.39	.....	Tensile strength.

Sheared the rivets.
Elongation of rivet-holes, ".20, ".19, ".18, ".21, ".24, ".25.

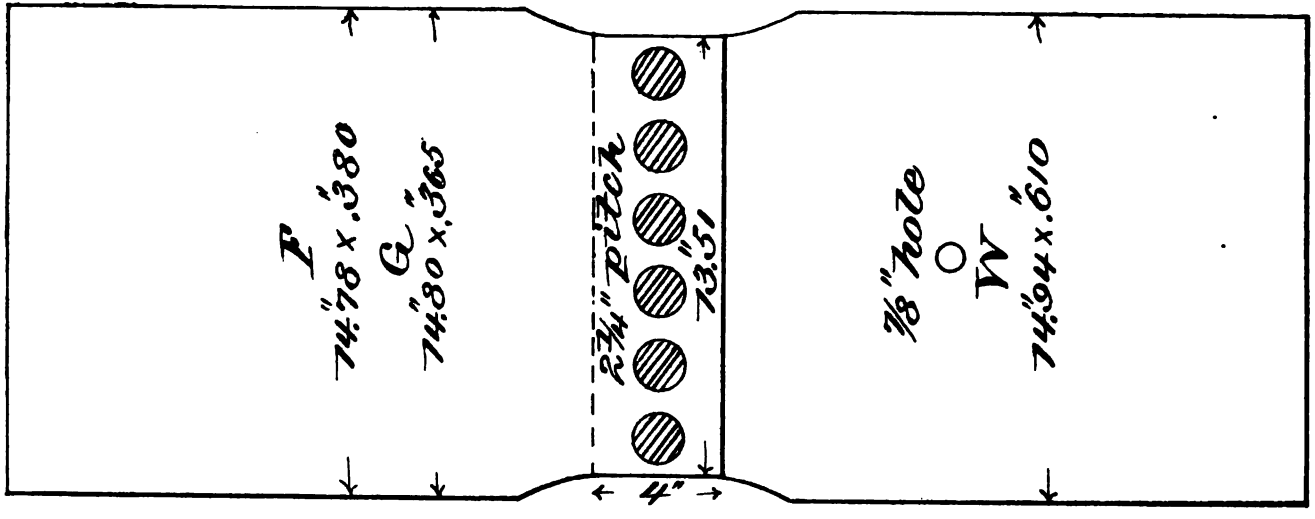
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	36,800
Tension on net section of plate	do....	62,560
Compression on bearing surface of rivets	do....	89,370
Shearing on rivets	do....	40,570

Efficiency of joint, 66.9 per cent.

No. 7450

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	8.241
Plate, net sectional area	do....	5.039
Plate, bearing surface of rivets	do....	3.202
Rivets, shearing area	do....	7.216

[Tested at temperature of 400° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds. 324,000	*Pounds.* 39,320	*Inch.*	*Inch.*	Tensile strength.

Sheared three rivets.
Elongation of rivet-holes, ".08 each.

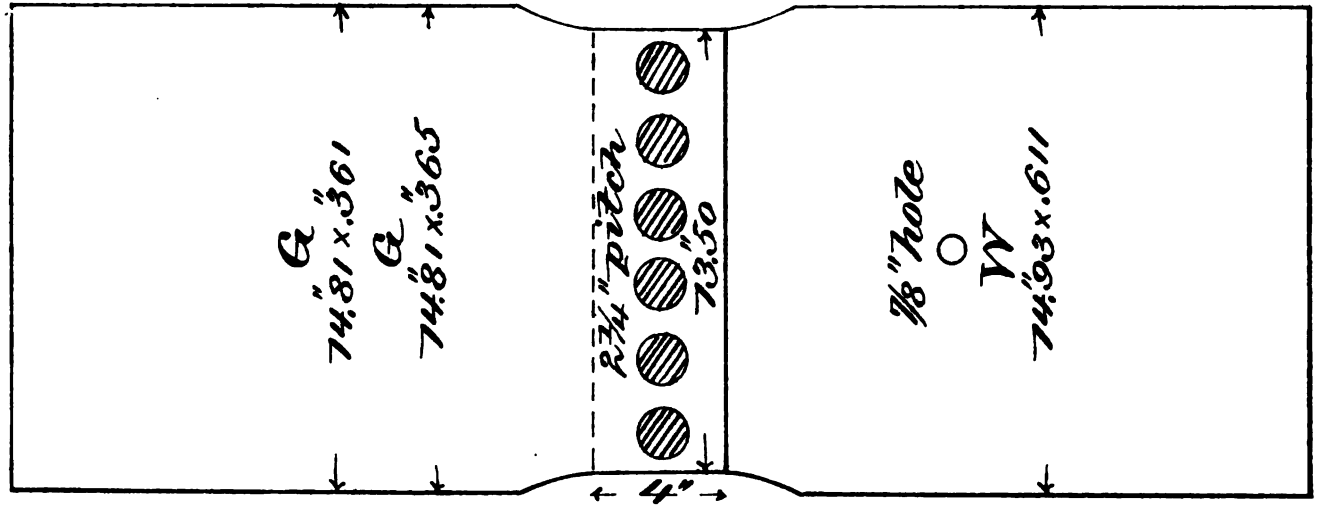
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	39,326
Tension on net section of plate	do....	64,290
Compression on bearing surface of rivets	do....	101,180
Shearing on rivets	do....	44,900

Efficiency of joint, 68.6 per cent.

No. 7451

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	8.249
Plate, net sectional area	do....	5.042
Plate, bearing surface of rivets	do....	3.207
Rivets, shearing area	do....	7.216

[Tested at temperature of 600° Fahr.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
304,000	36,850	.....	.....	Tensile strength.

Sheared the rivets.
Elongation of rivet-holes, ".12 each.

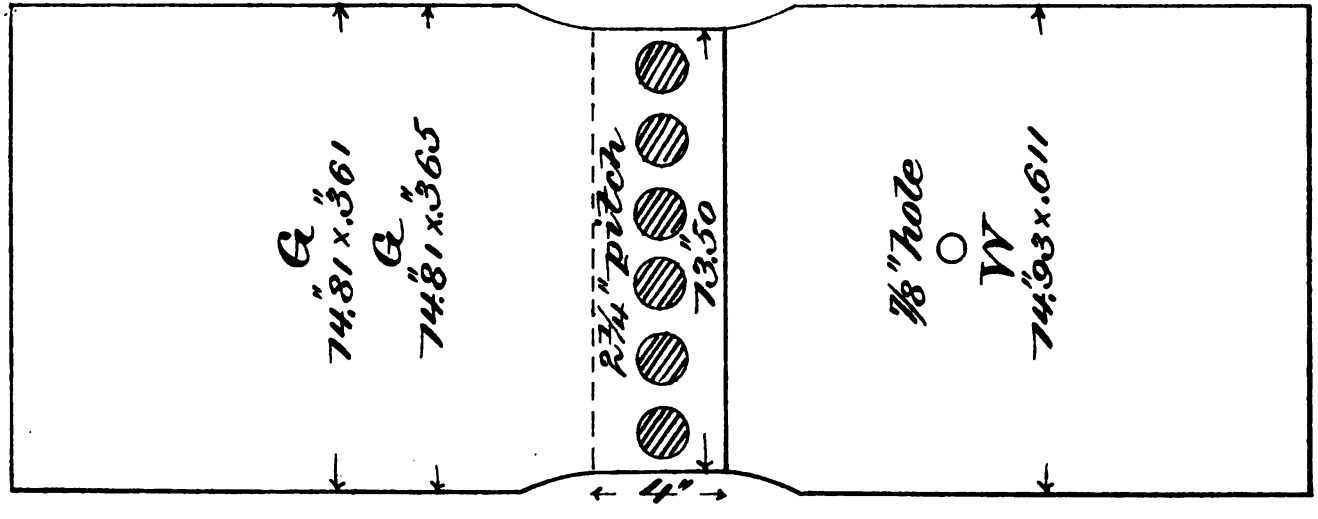
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	36,850
Tension on net section of plate	do....	60,290
Compression on bearing surface of rivets	do....	94,790
Shearing on rivets	do....	42,130

Efficiency of joint, 64.3 per cent.

No. 7451

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	8.249
Plate, net sectional area	do....	5.042
Plate, bearing surface of rivets	do....	3.207
Rivets, shearing area	do....	7.216

[Tested at temperature of 600° Fahr.]

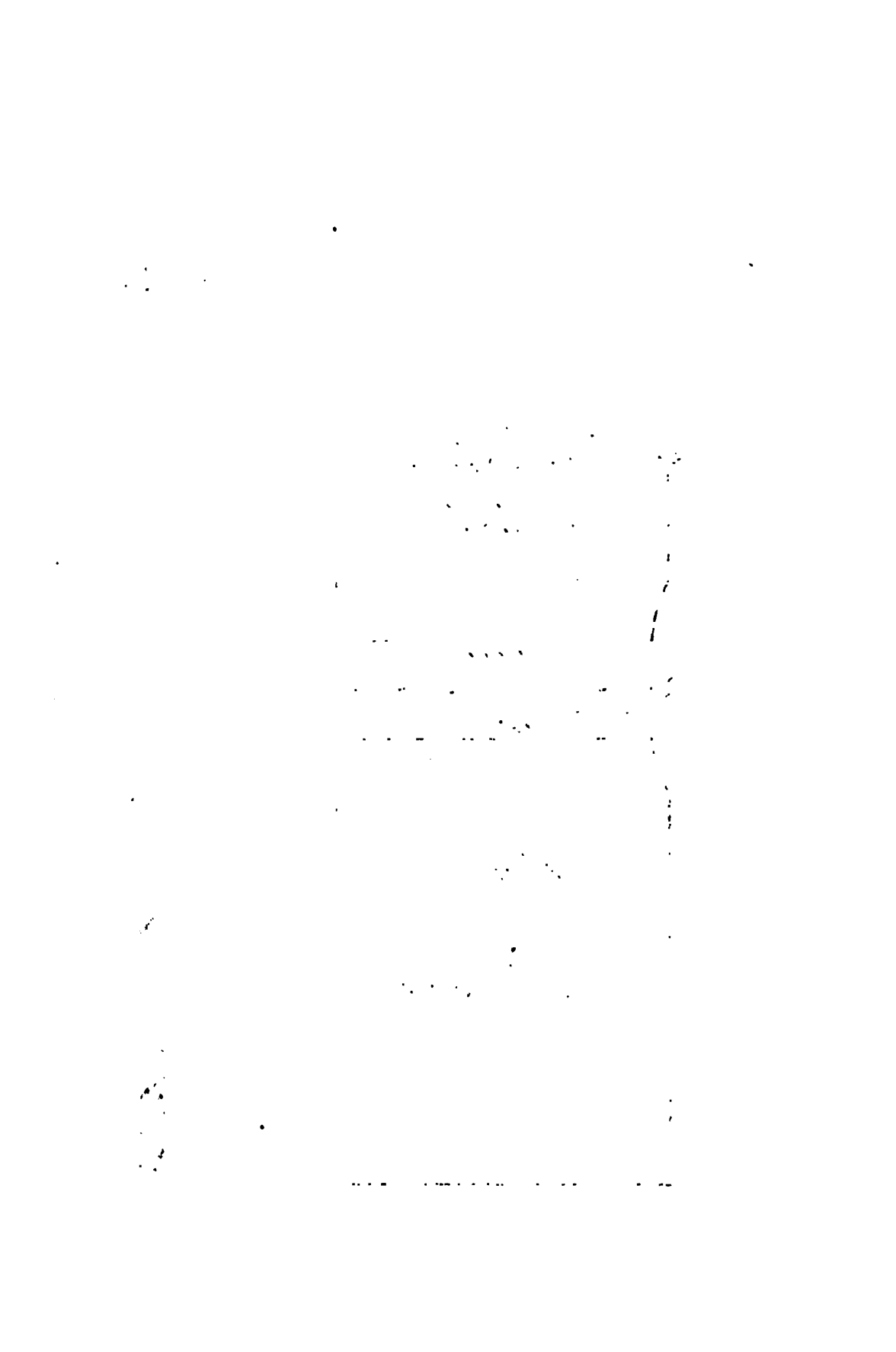
Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds. 304,000	*Pounds.* 36,850	*Inch.*	*Inch.*	Tensile strength.

Sheared the rivets.
Elongation of rivet-holes, ".12 each.

Maximum stress on joint.

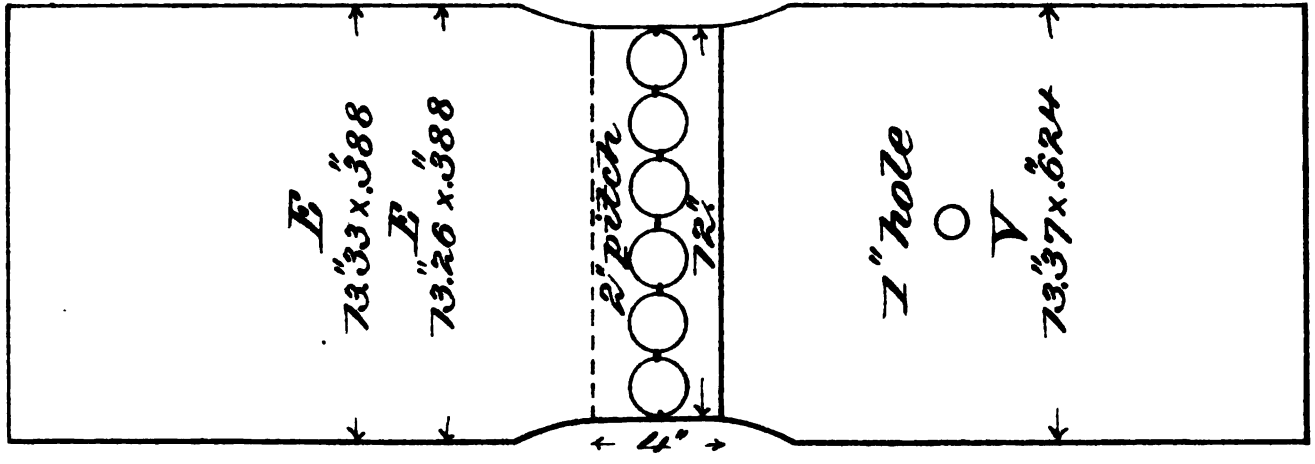
Tension on gross section of plate	pounds per square inch..	36,850
Tension on net section of plate	do....	60,290
Compression on bearing surface of rivets	do....	94,790
Shearing on rivets	do....	42,130

Efficiency of joint, 64.3 per cent.



No. 7452

⅝" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	7.488
Plate, net sectional area	do....	3.744
Plate, bearing surface of rivets	do....	3.744
Rivets, shearing area	do....	9.425

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
7,488	1,000	0.	0.	Initial load.
14,976	2,000	.0001	.....	
22,464	3,000	.0003	.....	
29,952	4,000	.0004	.....	
37,440	5,000	.0006	.0002	
44,928	6,000	.0010	.....	
52,416	7,000	.0040	.....	
59,904	8,000	.0050	.....	
67,392	9,000	.0057	.....	
74,880	10,000	.0064	.0055	
82,368	11,000	.0073	.....	
89,856	12,000	.0082	.....	
97,344	13,000	.0093	.....	
104,832	14,000	.0107	.....	
112,320	15,000	.0118	.0101	
119,808	16,000	.0128	.....	
127,296	17,000	.0138	.....	
134,784	18,000	.0147	.....	
142,272	19,000	.0160	.....	
149,760	20,000	.0180	.0141	
157,248	21,000	.0212	.....	
164,736	22,000	.0249	.....	
172,224	23,000	.0300	.....	
179,712	24,000	.0375	.....	
187,200	25,000	.0467	.0398	
194,688	26,000	.0587	.....	
202,176	27,000	.0712	.....	
209,664	28,000	.0892	.....	
217,152	29,000	.1157	.....	
224,640	30,000	.1397	.1295	
232,128	31,000	.20	.....	
239,616	32,000	.27	.....	
240,200	32,080	.31	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, lamellar.
Elongation of rivet-holes, ".43, ".43, ".41, ".41, ".41, ".42.
Area at fracture (one section), ".83×".40=.3320 square inch.
Contraction, 46.7 per cent.

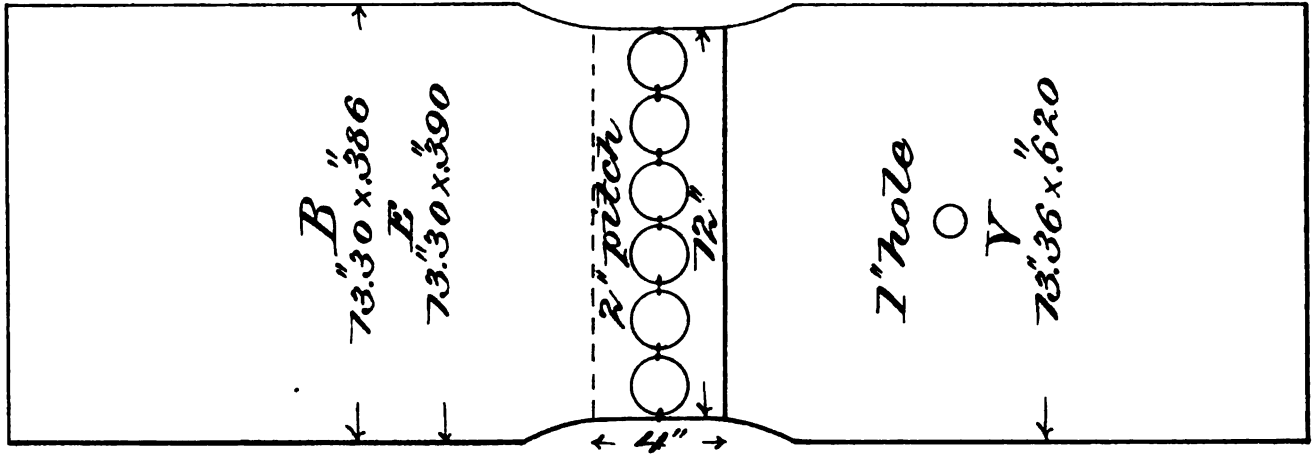
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	32,080
Tension on net section of plate	do	61,150
Compression on bearing surface of plate	do	64,150
Shearing on rivets	do	25,480

Efficiency of joint, 58.3 per cent.

No. 7453

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	7.440
Plate, net sectional area	do....	3.720
Plate, bearing surface of rivets	do....	3.720
Rivets, shearing area	do....	9.425

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
7,440	1,000	0.	0.	Initial load.
14,880	2,000	—.0001	.....	
22,320	3,000	—.0001	.....	
29,760	4,000	.0002	.....	
37,200	5,000	.0003	—.0002	
44,640	6,000	.0013	.....	
52,080	7,000	.0039	.....	
59,520	8,000	.0048	.....	
66,960	9,000	.0057	.....	
74,400	10,000	.0069	.0058	
81,840	11,000	.0090	.....	
89,280	12,000	.0095	.....	
96,720	13,000	.0103	.....	
104,160	14,000	.0121	.....	
111,600	15,000	.0134	.0105	
119,040	16,000	.0148	.....	
126,480	17,000	.0158	.....	
133,920	18,000	.0173	.....	
141,360	19,000	.0182	.....	
148,800	20,000	.0200	.0155	
156,240	21,000	.0227	.....	
163,680	22,000	.0285	.....	
171,120	23,000	.0365	.....	
178,560	24,000	.0438	.....	
186,000	25,000	.0520	.0445	
193,440	26,000	.0640	.....	
200,880	27,000	.0760	.....	
208,320	28,000	.0905	.....	
215,760	29,000	.1117	.....	
223,200	30,000	.14	.....	
230,640	31,000	.19	.....	
238,080	32,000	.27	.....	
238,500	32,060	.32	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, very lamellar. Open at edges ".03 each.
Elongation of rivet-holes, ".43, ".43, ".43, ".43, ".43, ".46.
Area at fracture (one section), ".84×".41=.3444 square inch.
Contraction, 44.4 per cent.

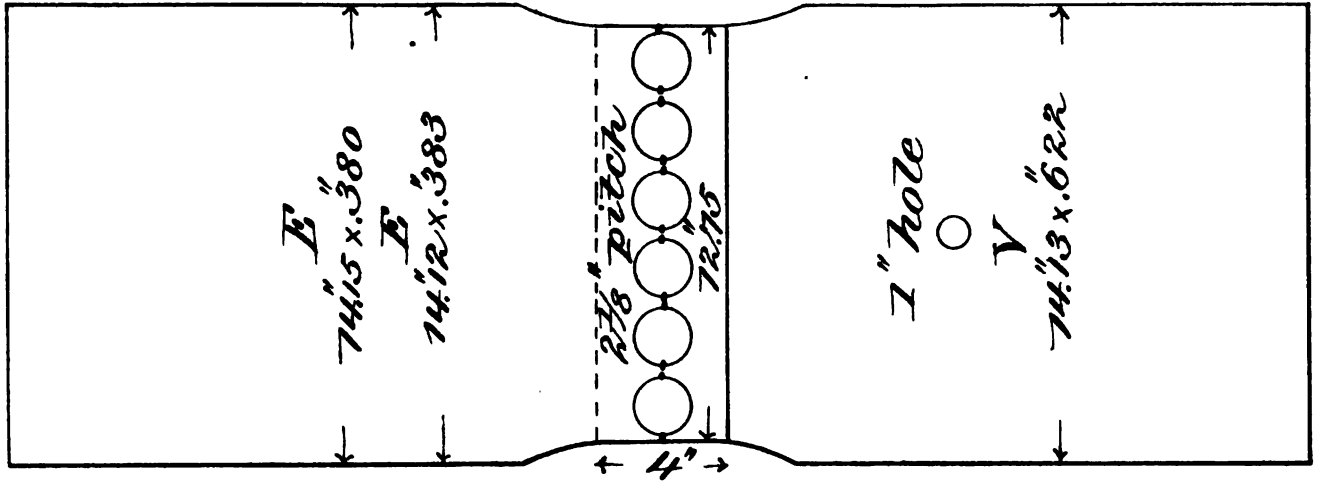
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	32,060
Tension on net section of plate	do....	64,110
Compression on bearing surface of rivets	do....	64,110
Shearing on rivets	do....	25,300

Efficiency of joint, 58.3 per cent.

No. 7454

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	7.031
Plate, net sectional area	do	4.199
Plate, bearing surface of rivets	do	3.732
Rivets, shearing area	do	9.425

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
7,931	1,000	0.	0.	Initial load.
15,862	2,000	.0001	.....	
23,793	3,000	.0006	.....	
31,724	4,000	.0008	.0005	
39,655	5,000	.0013	.....	
47,586	6,000	.0045	.....	
55,517	7,000	.0060	.....	
63,448	8,000	.0070	.....	
71,379	9,000	.0078	.0067	
79,310	10,000	.0086	.....	
87,241	11,000	.0100	.....	
95,172	12,000	.0108	.....	
103,103	13,000	.0117	.....	
111,034	14,000	.0127	.0108	
118,965	15,000	.0127	.0108	
126,896	16,000	.0141	.....	
134,827	17,000	.0151	.....	
142,758	18,000	.0163	.....	
150,689	19,000	.0177	.....	
158,620	20,000	.0191	.0157	
166,551	21,000	.0209	.....	
174,481	22,000	.0232	.....	
182,413	23,000	.0270	.....	
190,344	24,000	.0348	.....	
198,275	25,000	.0461	.0398	
206,206	26,000	.0590	.....	
214,317	27,000	.0710	.....	
222,068	28,000	.0900	.....	
229,999	29,000	.1140	.....	
237,930	30,000	.13	.....	
245,861	31,000	.17	.....	
253,792	32,000	.19	.....	
261,723	33,000	.23	.....	
269,654	34,000	.31	.....	
270,600	34,120	.36	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, lamellar. Open at edges ″.13 and ″.10.
Elongation of rivet-holes, ″.48, ″.50, ″.50, ″.52, ″.52, ″.52.
Area at fracture (one section), ″.92×″.40=.3680 square inch.
Contraction, 47.4 per cent.

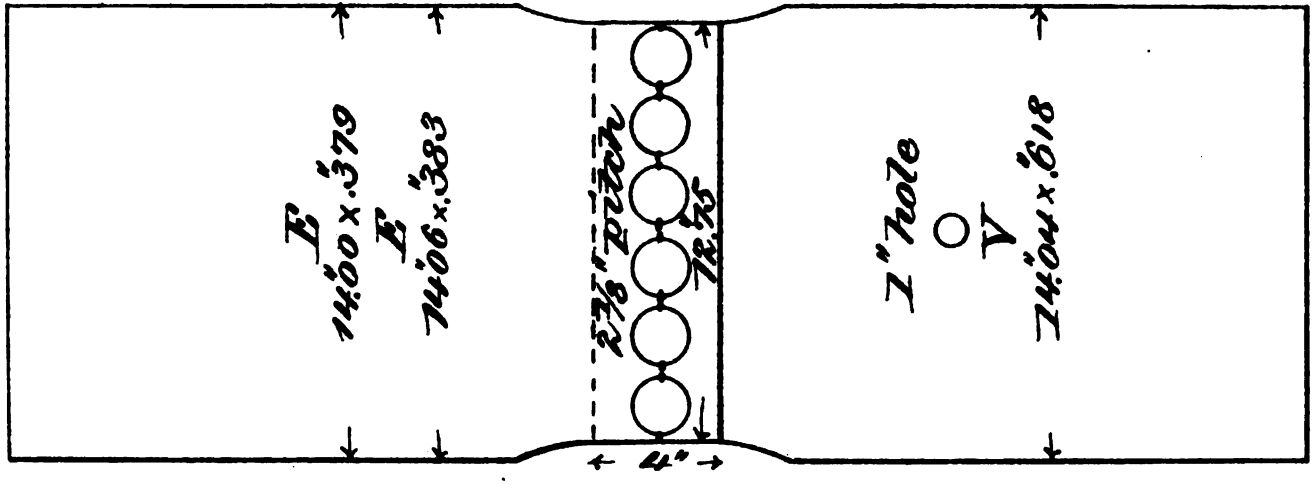
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	34,120
Tension on net section of plate	do	64,440
Compression on bearing surface of rivets	do	72,510
Shearing on rivets	do	28,710

Efficiency of joint, 60.0 per cent.

No. 7455

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	7.880
Plate, net sectional area	do....	4.172
Plate, bearing surface of rivets	do....	3.708
Rivets, shearing area	do....	9.425

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
7,880	1,000	0.	0.	Initial load.
15,760	2,000	.0000	.....	
23,640	3,000	−.0001	.....	
31,520	4,000	−.0002	.....	
39,400	5,000	.0000	−.0001	
47,280	6,000	+.0006	.....	
55,160	7,000	.0026	.....	
63,040	8,000	.0036	.....	
70,920	9,000	.0040	.....	
78,800	10,000	.0044	.0050	
86,680	11,000	.0062	.....	
94,560	12,000	.0068	.....	
102,440	13,000	.0075	.....	
110,320	14,000	.0082	.....	
118,200	15,000	.0100	.0104	
126,080	16,000	.0112	.....	
133,960	17,000	.0117	.....	
141,840	18,000	.0132	.....	
149,720	19,000	.0146	.....	
157,600	20,000	.0157	.0148	
165,480	21,000	.0176	.....	
173,360	22,000	.0199	.....	
181,240	23,000	.0227	.....	
189,120	24,000	.0315	.....	
197,000	25,000	.0435	.0394	
204,800	26,000	.0585	.....	
212,760	27,000	.0700	.....	
220,640	28,000	.0905	.....	
228,520	29,000	.1100	.....	
236,400	30,000	.1298	.....	
244,280	31,000	.16	.....	
252,160	32,000	.19	.....	
260,040	33,000	.24	.....	
267,920	34,000	.33	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, lamellar. Open at edges ″.05 each.
Elongation of rivet-holes, ″.53, ″.52, ″.50, ″.50, ″.48, ″.47.
Area at fracture (one section), ″.93 × ″.40 = .3720 square inch.
Contraction, 46.4 per cent.

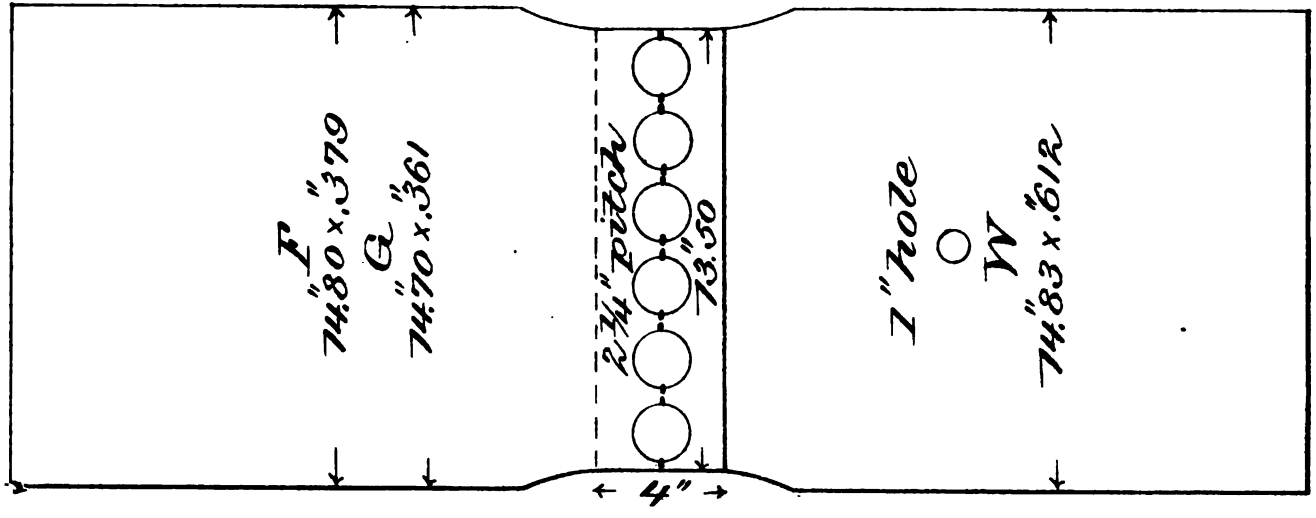
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	34,000
Tension on net section of plate	do....	64,220
Compression on bearing surface of rivets	do....	72,250
Shearing on rivets	do....	28,420

Efficiency of joint, 61.8 per cent.

No. 7456

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	8.262
Plate, net sectional area	do....	4.590
Plate, bearing surface of rivets	do....	3.672
Rivets, shearing area	do....	9.425

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,262	1,000	.0	0.	Initial load.
16,524	2,000	.0000	.....	
24,786	3,000	.0001	.....	
33,048	4,000	.0002	.....	
41,310	5,000	.0004	.0001	
49,572	6,000	.0007	.....	
57,834	7,000	.0018	.....	
66,096	8,000	.0043	.....	
74,358	9,000	.0053	.....	
82,620	10,000	.0063	.0056	
90,882	11,000	.0076	.....	
99,144	12,000	.0087	.....	
107,406	13,000	.0096	.....	
115,668	14,000	.0111	.....	
123,930	15,000	.0121	.0102	
132,192	16,000	.0136	.....	
140,454	17,000	.0151	.....	
148,716	18,000	.0160	.....	
156,978	19,000	.0175	.....	
165,240	20,000	.0183	.0146	
173,502	21,000	.0206	.....	
181,764	22,000	.0219	.....	
190,026	23,000	.0249	.....	
198,288	24,000	.0308	.....	
206,550	25,000	.0395	.0332	
214,813	26,000	.0550	.....	
223,074	27,000	.0695	.....	
231,336	28,000	.0895	.....	
239,598	29,000	.1050	.....	
247,860	30,000	.1235	.....	
256,122	31,000	.14	.....	
264,384	32,000	.17	.....	
272,646	33,000	.20	.....	
280,908	34,000	.25	.....	
289,170	35,000	.31	.....	
297,432	36,000	.38	.....	
301,500	36,490	.47	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, lamellar. Open at edges ″.03 and ″.12.
Elongation of rivet-holes, ″.56, ″.53, ″.51, ″.51, ″.54, ″.58.
Area at fracture (one section), 1″.07×″.40=.4280 square inch.
Contraction, 44.0 per cent.

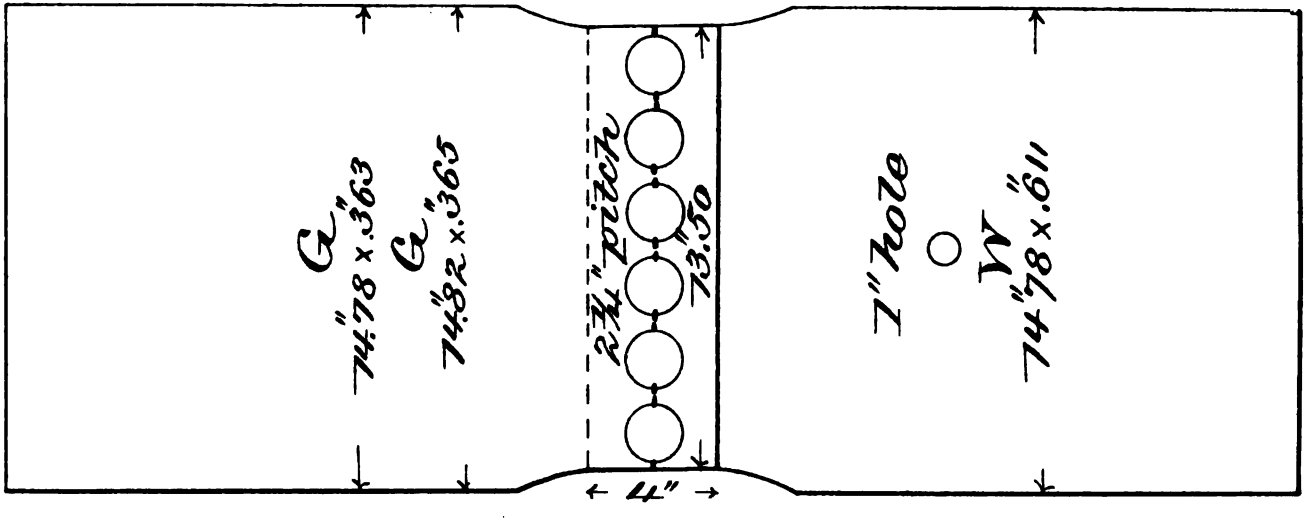
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	36,490
Tension on net section of plate	do....	65,680
Compression on bearing surface of rivets	do....	82,110
Shearing on rivets	do....	32,000

Efficiency of joint, 63.6 per cent.

No. 7457

⅝" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	8.243
Plate, net sectional area	do....	4.589
Plate, bearing surface of rivets	do....	3.666
Rivets, shearing area	do....	2.425

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,249	1,000	0.	0.	Initial load.
16,498	2,000	—.0001	.....	
24,747	3,000	—.0001	.....	
32,996	4,000	—.0001	.....	
41,245	5,000	—.0001	—.0003	
49,494	6,000	.0000	.....	
57,743	7,000	.0001	.....	
65,992	8,000	.0019	.....	
74,241	9,000	.0032	.....	
82,490	10,000	.0037	.0038	
90,739	11,000	.0046	.....	
98,988	12,000	.0050	.....	
107,237	13,000	.0057	.....	
115,486	14,000	.0065	.....	
123,735	15,000	.0076	.0074	
131,984	16,000	.0083	.....	
140,233	17,000	.0100	.....	
148,482	18,000	.0120	.....	
156,731	19,000	.0129	.....	
164,980	20,000	.0140	.0120	
173,229	21,000	.0160	.....	
181,478	22,000	.0177	.....	
189,727	23,000	.0203	.....	
197,976	24,000	.0255	.....	
206,225	25,000	.0340	.0286	
214,474	26,000	.0435	.....	
222,723	27,000	.0540	.....	
230,972	28,000	.0705	.....	
239,221	29,000	.0905	.....	
247,470	30,000	.1090	.....	
255,719	31,000	.1310	.....	
263,968	32,000	.17	.....	
272,217	33,000	.21	.....	
280,466	34,000	.25	.....	
288,715	35,000	.29	.....	
296,964	36,000	.39	.....	
297,100	36,020	.42	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky. Open at edges ″.20 and ″.13.
Elongation of rivet-holes, ″.55, ″.54, ″.53, ″.53, ″.53, ″.53.
Area at fracture (one section), 1″.05×″.39=.4095 square inch.
Contraction, 46.3 per cent.

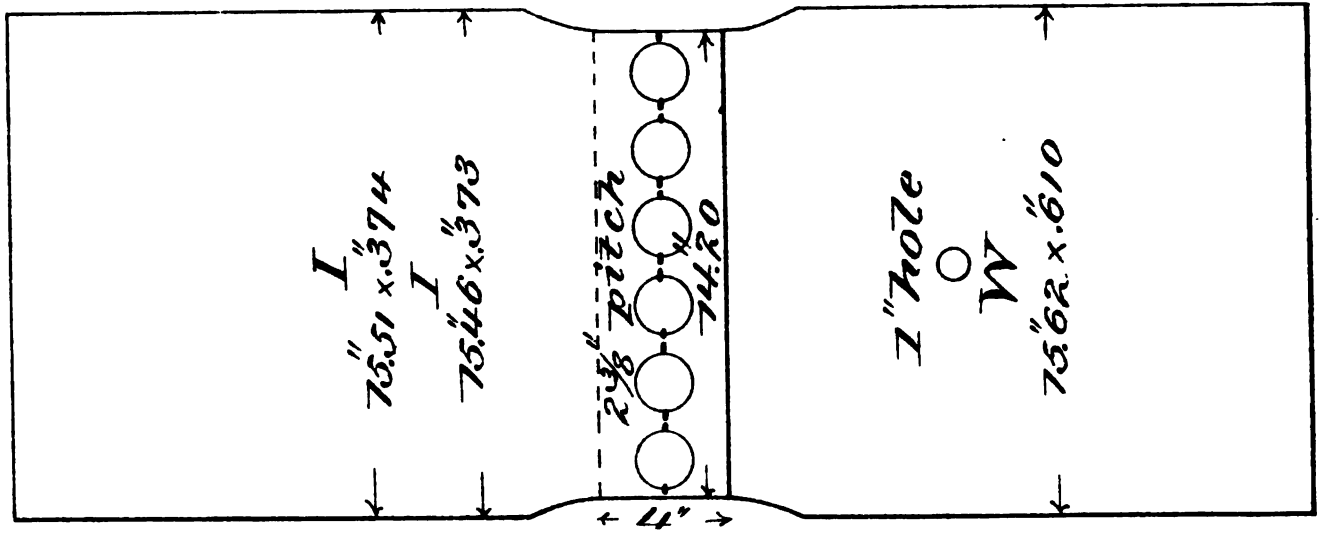
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	36,020
Tension on net section of plate	do....	64,320
Compression on bearing surface of rivets	do....	81,040
Shearing on rivets	do....	31,520

Efficiency of joint, 62.8 per cent.

No. 7458

⅝" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	8.662
Plate, net sectional area	do....	5.002
Plate, bearing surface of rivets	do....	3.660
Rivets, shearing area	do....	9.425

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,662	1,000	0.	0.	Initial load.
17,324	2,000	—.0003	.....	
25,986	3,000	—.0004	.....	
34,648	4,000	—.0002	.....	
43,310	5,000	.0000	—.0004	
51,972	6,000	.0004	.....	
60,634	7,000	.0021	.....	
69,296	8,000	.0044	.....	
77,958	9,000	.0057	.....	
86,620	10,000	.0065	.0060	
95,282	11,000	.0075	.....	
103,944	12,000	.0086	.....	
112,606	13,000	.0097	.....	
121,268	14,000	.0105	.....	
129,930	15,000	.0117	.0102	
138,592	16,000	.0136	.....	
147,254	17,000	.0150	.....	
155,916	18,000	.0165	.....	
164,578	19,000	.0177	.....	
173,240	20,000	.0187	.0157	
181,902	21,000	.0215	.....	
190,564	22,000	.0231	.....	
199,226	23,000	.0285	.....	
207,888	24,000	.0369	.....	
216,550	25,000	.0455	.....	
225,212	26,000	.0617	.....	
233,874	27,000	.0731	.....	
242,536	28,000	.0896	.....	
251,198	29,000	.1043	.....	
259,860	30,000	.1235	.....	
268,522	31,000	.16	.....	
277,184	32,000	.18	.....	
285,846	33,000	.22	.....	
294,508	34,000	.24	.....	
303,170	35,000	.28	.....	
311,832	36,000	.32	.....	
320,494	37,000	.39	.....	
326,700	37,720	.51	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slightly lamellar. Open at edges ″.15 and ″.20.
Elongation of rivet-holes, ″.62, ″.58, ″.58, ″.58, ″.61, ″.65.
Area at fracture (one section), 1″.16×″.39=.4524 square inch.
Contraction, 46.6 per cent.

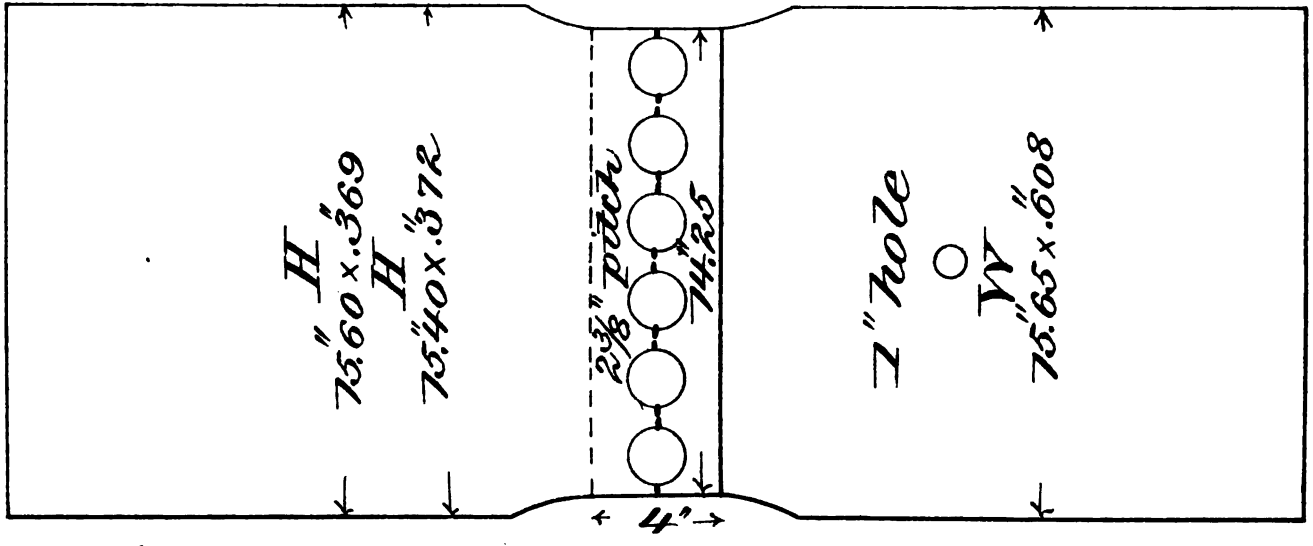
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	37,720
Tension on net section of plate	do....	65,310
Compression on bearing surface of rivets	do....	89,260
Shearing on rivets	do....	38,490

Efficiency of joint, 65.8 per cent.

No. 7459

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	8.664
Plate, net sectional area	do	5.016
Plate, bearing surface of rivets	do	3.648
Rivets, shearing area	do	9.425

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,664	1,000	0.	0.	Initial load.
17,328	2,000	.0004	.....	
25,992	3,000	.0008	.....	
34,656	4,000	.0010	.....	
43,320	5,000	.0014	.0004	
51,984	6,000	.0029	.....	
60,648	7,000	.0040	.....	
69,112	8,000	.0054	.....	
77,976	9,000	.0071	.....	
86,640	10,000	.0084	.0062	
95,304	11,000	.0094	.....	
103,968	12,000	.0108	.....	
112,632	13,000	.0121	.....	
121,296	14,000	.0134	.....	
129,960	15,000	.0150	.0111	
138,624	16,000	.0170	.....	
147,288	17,000	.0182	.....	
155,952	18,000	.0195	.....	
164,616	19,000	.0204	.....	
173,280	20,000	.0223	.0169	
181,944	21,000	.0245	.....	
190,608	22,000	.0260	.....	
199,272	23,000	.0298	.....	
207,936	24,000	.0410	.....	
216,600	25,000	.0501	.0412	
225,264	26,000	.0640	.....	
233,928	27,000	.0783	.....	
242,592	28,000	.0940	.....	
251,256	29,000	.1100	.....	
259,920	30,000	.1320	.1200	
268,584	31,000	.17	.....	
277,248	32,000	.19	.....	
285,912	33,000	.23	.....	
294,576	34,000	.27	.....	
303,240	35,000	.31	.....	
311,904	36,000	.37	.....	
320,568	37,000	.43	.....	
325,300	37,540	.54	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slightly lamellar. Open at edges ″.10 and ″.25.
Elongation of rivet-holes, ″.56, ″.58, ″.56, ″.60, ″.65, ″.71.
Area at fracture (one section) 1″.16 × ″.41 = .4756 square inch.
Contraction, 43.1 per cent.

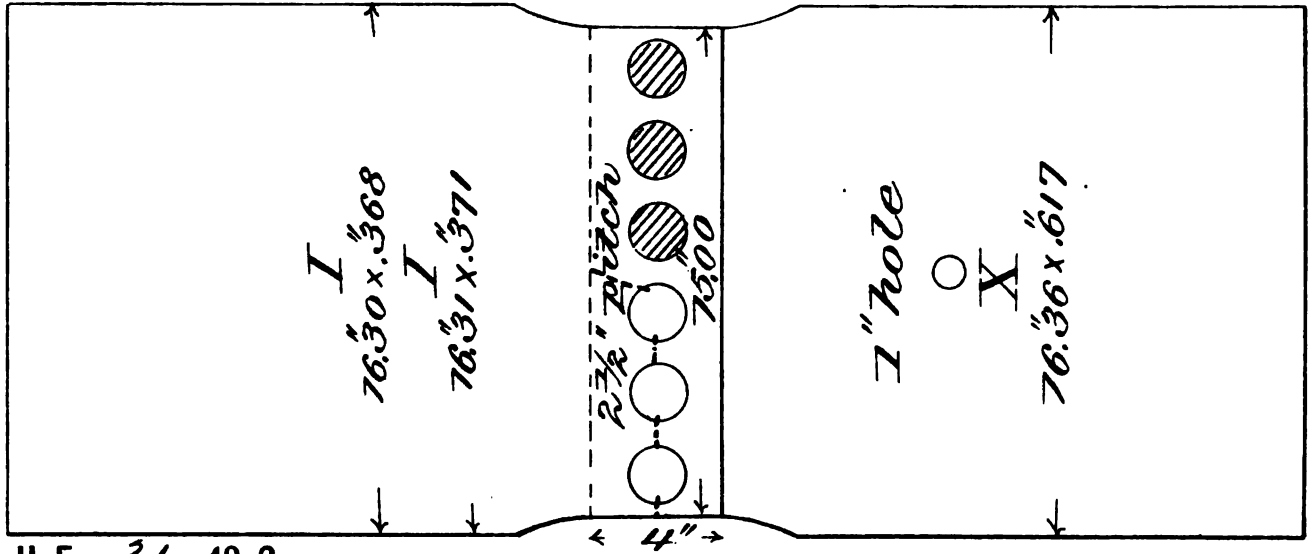
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	37,540
Tension on net section of plate	do	64,850
Compression on bearing surface of rivets	do	89,170
Shearing on rivets	do	34,510

Efficiency of joint, 65.5 per cent.

No. 7460

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	9.255
Plate, net sectional area	do....	5.553
Plate, bearing surface of rivets	do....	3.702
Rivets, shearing area	do....	9.425

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,255	1,000	0.	0.	Initial load.
18,510	2,000	.0001	.....	
27,765	3,000	.0003	.....	
37,020	4,000	.0005	.....	
46,275	5,000	.0007	.0003	
55,530	6,000	.0014	.....	
64,785	7,000	.0043	.....	
74,040	8,000	.0054	.....	
83,295	9,000	.0060	.....	
92,550	10,000	.0069	.0058	
101,805	11,000	.0085	.....	
111,060	12,000	.0096	.....	
120,315	13,000	.0107	.....	
129,570	14,000	.0116	.....	
138,825	15,000	.0129	.0105	
148,080	16,000	.0146	.....	
157,335	17,000	.0155	.....	
166,590	18,000	.0166	.....	
175,845	19,000	.0180	.....	
185,100	20,000	.0194	.0151	
194,355	21,000	.0210	.....	
203,610	22,000	.0223	.....	
212,865	23,000	.0262	.....	
222,120	24,000	.0380	.....	
231,375	25,000	.0570	.0476	
240,630	26,000	.0751	.....	
249,885	27,000	.0900	.....	
259,140	28,000	.1060	.....	
268,395	29,000	.1232	.....	
277,650	30,000	.135	.....	
286,905	31,000	.17	.....	
296,160	32,000	.20	.....	
305,415	33,000	.23	.....	
314,670	34,000	.28	.....	
323,925	35,000	.33	.....	
333,180	36,000	.40	.....	
342,435	37,000	.50	.....	
345,200	38,000	.57	.....	Tensile strength.

Sheared three rivets and tore plate across three sections.

Appearance, silky.

Area at fracture (one section), 1″.29 × ″.39 = .5031 square inch.

Contraction, 45.6 per cent.

Elongation of rivet-holes (″.34, ″.37, ″.40, sheared rivets in these holes), ″.78, ″.71, ″.69.

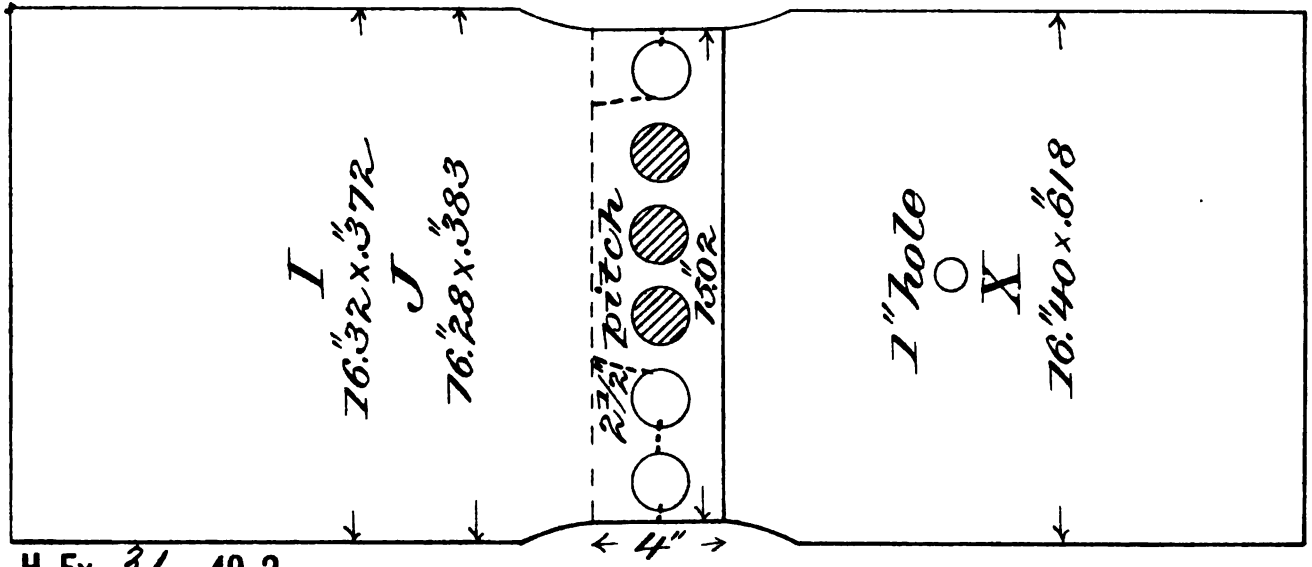
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	37,300
Tension on net section of plate	do....	62,160
Compression on bearing surface of rivets	do....	93,250
Shearing on rivets	do....	36,630

Efficiency of joint, 66.6 per cent.

No. 7461

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	9.262
Plate, net sectional area	do	5.574
Plate, bearing surface of rivets	do	3.708
Rivets, shearing area	do	9.425

Applied loads.		In gauged ength.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,282	1,000	0.	0.	Initial load.
18,564	2,000	.0002	.....	
27,846	3,000	.0003	.....	
37,128	4,000	.0005	.....	
46,410	5,000	.0018	.....	
55,692	6,000	.0024	.....	
64,974	7,000	.0056	.....	
74,256	8,000	.0078	.....	
83,538	9,000	.0089	.....	
92,820	10,000	.0100	.0090	
102,102	11,000	.0120	.....	
111,384	12,000	.0133	.....	
120,666	13,000	.0144	.....	
129,948	14,000	.0154	.....	
139,230	15,000	.0164	.0136	
148,512	16,000	.0179	.....	
157,794	17,000	.0193	.....	
167,076	18,000	.0212	.....	
176,358	19,000	.0230	.....	
185,640	20,000	.0245	.0197	
194,922	21,000	.0277	.....	
204,204	22,000	.0314	.....	
213,486	23,000	.0412	.....	
222,768	24,000	.0513	.....	
232,050	25,000	.0612	.0529	
241,332	26,000	.0770	.....	
250,614	27,000	.0895	.....	
259,896	28,000	.1058	.....	
269,178	29,000	.1280	.....	
278,460	30,000	.16	.....	
287,742	31,000	.19	.....	
297,024	32,000	.22	.....	
306,306	33,000	.26	.....	
315,588	34,000	.30	.....	
324,870	35,000	.36	.....	
334,152	36,000	.42	.....	
343,434	37,000	.52	.....	Tensile strength.

Sheared three rivets and fractured three sections of plate.
Appearance, silky.
Area at fracture (one section), 1″.22×″.36=.4392 square inch.
Contraction, 52.6 per cent.
Elongation of rivet-holes (″.44, ″.35, ″.30; sheared rivets in these holes), ″.78, ″.75.

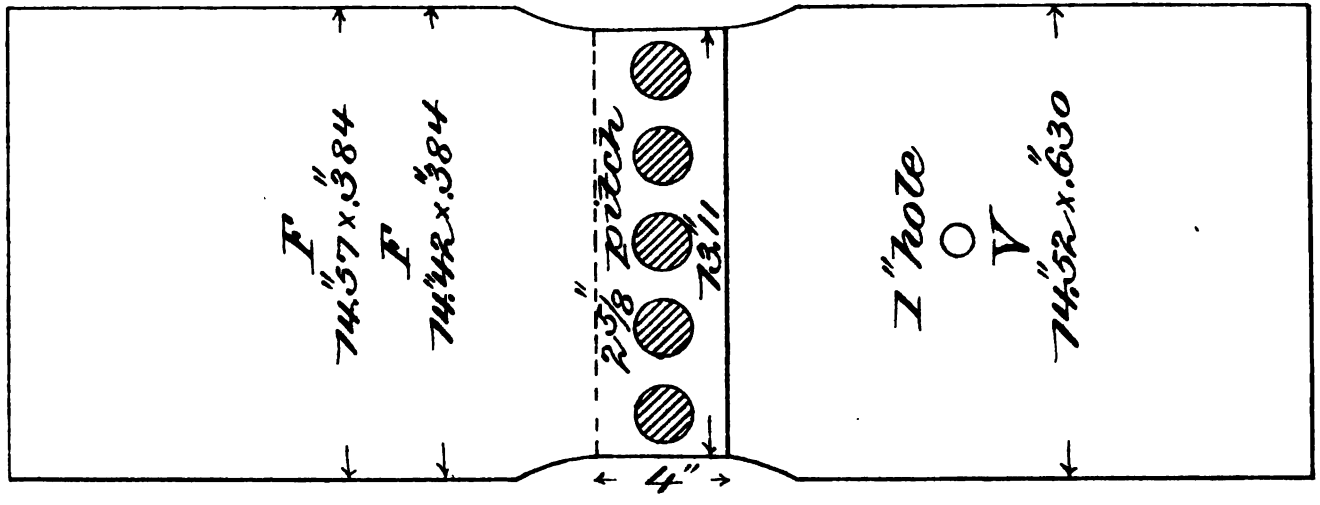
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	37,000
Tension on net section of plate	do	61,610
Compression on bearing surface of rivets	do	92,620
Shearing on rivets	do	36,440

Efficiency of joint, 66.1 per cent.

No. 7462

5/8" steel plate



H Ex 31 ... 49 2

Areas.

Plate, gross sectional area	square inches	8.259
Plate, net sectional area	do	5.109
Plate, bearing surface of rivets	do	3.150
Rivets, shearing area	do	7.854

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,259	1,000	0.	0.	Initial load.
16,518	2,000	.0002	.....	
24,777	3,000	.0005	.....	
33,036	4,000	.0005	.....	
41,295	5,000	.0007	.0004	
49,554	6,000	.0035	.....	
57,813	7,000	.0050	.....	
66,072	8,000	.0061	.....	
74,331	9,000	.0087	.....	
82,590	10,000	.0115	.0101	
90,849	11,000	.0125	.....	
99,108	12,000	.0133	.....	
107,367	13,000	.0145	.....	
115,626	14,000	.0160	.....	
123,885	15,000	.0175	.0148	
132,144	16,000	.0200	.....	
140,403	17,000	.0222	.....	
148,662	18,000	.0254	.....	
156,921	19,000	.0269	.....	
165,180	20,000	.0289	.0237	
173,439	21,000	.0320	.....	
181,698	22,000	.0360	.....	
189,957	23,000	.0467	.....	
198,216	24,000	.0610	.....	
206,475	25,000	.0726	.0650	
214,734	26,000	.0915	.....	
222,993	27,000	.1060	.....	
231,252	28,000	.1220	.....	
239,511	29,000	.16	.....	
247,770	30,000	.18	.....	
256,029	31,000	.21	.....	
264,288	32,000	.24	.....	
272,547	33,000	.29	.....	
280,806	34,000	.33	.....	
289,065	35,000	.40	.....	
295,500	35,780	.45	.....	Tensile strength.

Sheared the rivets.
Elongation of rivet-holes, ".31, ".30, ".26, ".25, ".24.

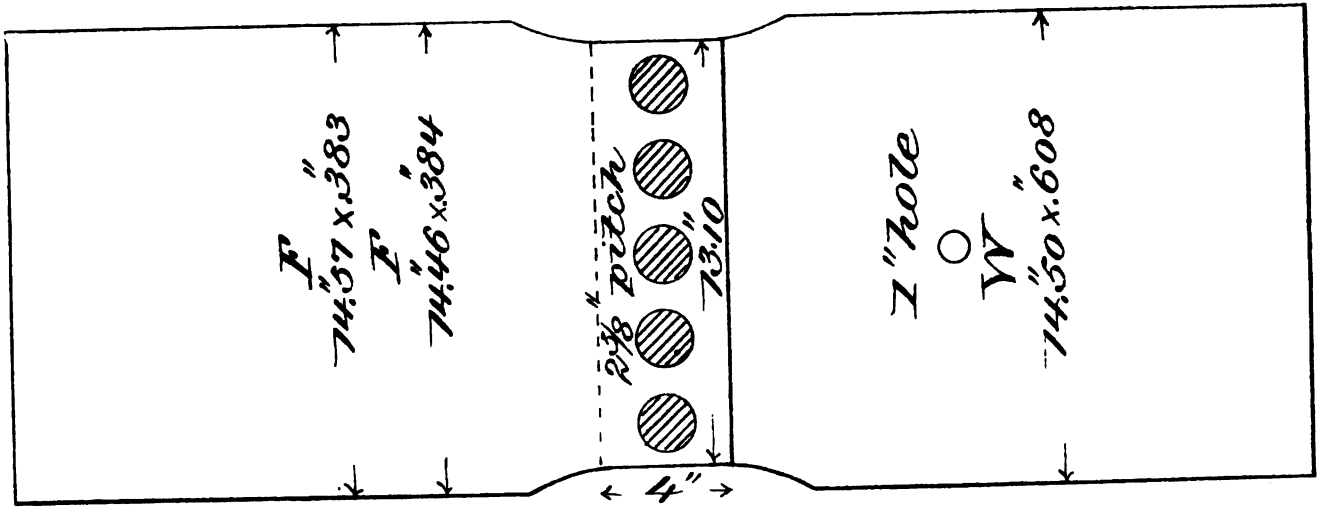
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	35,780
Tension on net section of plate	do	57,840
Compression on bearing surface of rivets	do	93,810
Shearing on rivets	do	37,620

Efficiency of joint, 65.0 per cent.

No. 7463

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	7.965
Plate, net sectional area	do....	4.925
Plate, bearing surface of rivets	do....	3.040
Rivets, shearing area	do....	7.584

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
7,965	1,000	0.	0.	Initial load.
15,930	2,000	−.0002	.....	
23,895	3,000	−.0003	.....	
31,860	4,000	−.0001	.....	
39,825	5,000	−.0001	−.0001	
47,790	6,000	+.0001	.....	
55,755	7,000	.0005	.....	
63,720	8,000	.0016	.....	
71,685	9,000	.0028	.....	
79,650	10,000	.0048	.0050	
87,615	11,000	.0068	.....	
95,580	12,000	.0078	.....	
103,545	13,000	.0087	.....	
111,510	14,000	.0095	.....	
119,475	15,000	.0102	.0099	
127,440	16,000	.0124	.....	
135,405	17,000	.0132	.....	
143,370	18,000	.0137	.....	
151,335	19,000	.0149	.....	
159,300	20,000	.0160	.0148	
167,265	21,000	.0190	.....	
175,230	22,000	.0211	.....	
183,195	23,000	.0275	.....	
191,160	24,000	.0293	.....	
199,125	25,000	.0542	.0523	
207,090	26,000	.0680	.....	
215,055	27,000	.0800	.....	
223,020	28,000	.0948	.....	
230,985	29,000	.1140	.....	
238,950	30,000	.1350	.....	
246,915	31,000	.16	.....	
254,880	32,000	.18	.....	
262,845	33,000	.22	.....	
270,810	34,000	.27	.....	
278,775	35,000	.32	.....	
286,740	36,000	.37	.....	
294,400	36,960	.....	.....	Tensile strength.

Sheared the rivets.
Elongation of rivet-holes, ″.23, ″.32, ″.33, ″.26, ″.22.

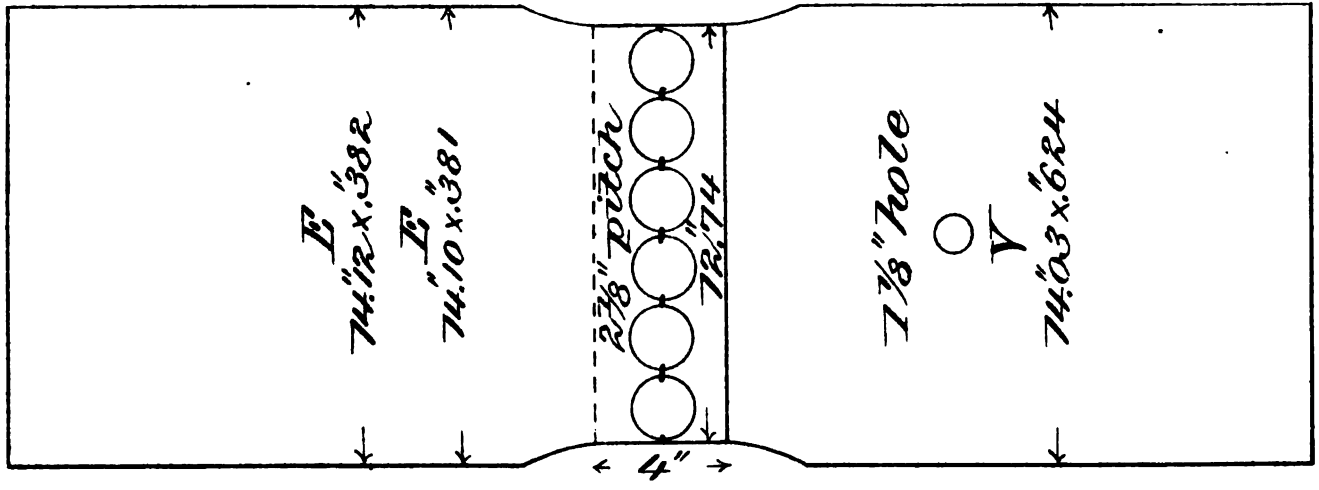
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	36,960
Tension on net section of plate	do....	59,770
Compression on bearing surface of rivets	do....	96,840
Shearing on rivets	do....	37,500

Efficiency of joint, 64.5 per cent.

No. 7464

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	7.950
Plate, net sectional area	do....	3.738
Plate, bearing surface of rivets	do....	4.212
Rivets, shearing area	do....	11.928

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
247,200	31,090	.32	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, lamellar.
Area at fracture (one section), $''.81 \times ''.39 = .3159$ square inch.
Contraction, 49.3 per cent.
Elongation of rivet-holes, ''.45 each.

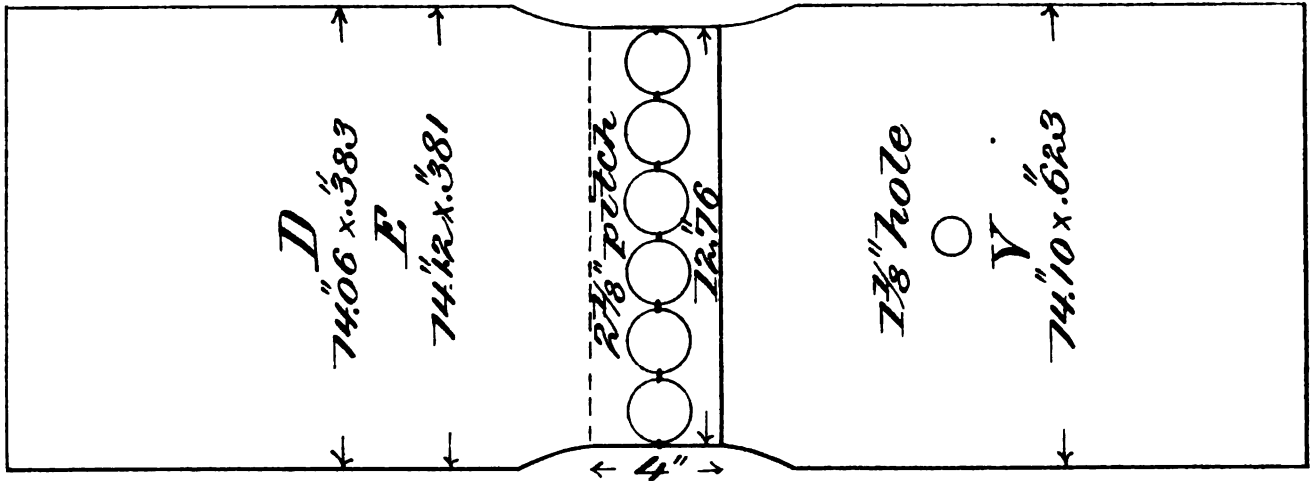
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	31,090
Tension on net section of plate	do....	66,130
Compression on bearing surface of rivets	do....	59,690
Shearing on rivets a	do....	20,720

Efficiency of joint, 56.5 per cent.

No. 7465

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	7.949
Plate, net sectional area	do....	3.744
Plate, bearing surface of rivets	do....	4.205
Rivets, shearing area	do....	11.928

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
7,949	1,000	0.	0.	Initial load.
15,898	2,000	.0002	.....	
23,847	3,000	.0004	.....	
31,796	4,000	.0006	.....	
39,745	5,000	.0010	.0007	
47,694	6,000	.0032	.....	
55,643	7,000	.0045	.....	
63,592	8,000	.0055	.....	
71,541	9,000	.0062	.....	
79,490	10,000	.0080	.0064	
87,439	11,000	.0095	.....	
95,388	12,000	.0099	.....	
103,337	13,000	.0110	.....	
111,286	14,000	.0120	.....	
119,235	15,000	.0130	.0108	
127,184	16,000	.0151	.....	
247,200	31,090	.....	.....	Tensile strength.

Fractured plate along line of riveting. Open at edges ″.03 each. Elongation of rivet-holes, ″.42, ″.42, ″.43, ″.44, ″.44, ″.44.

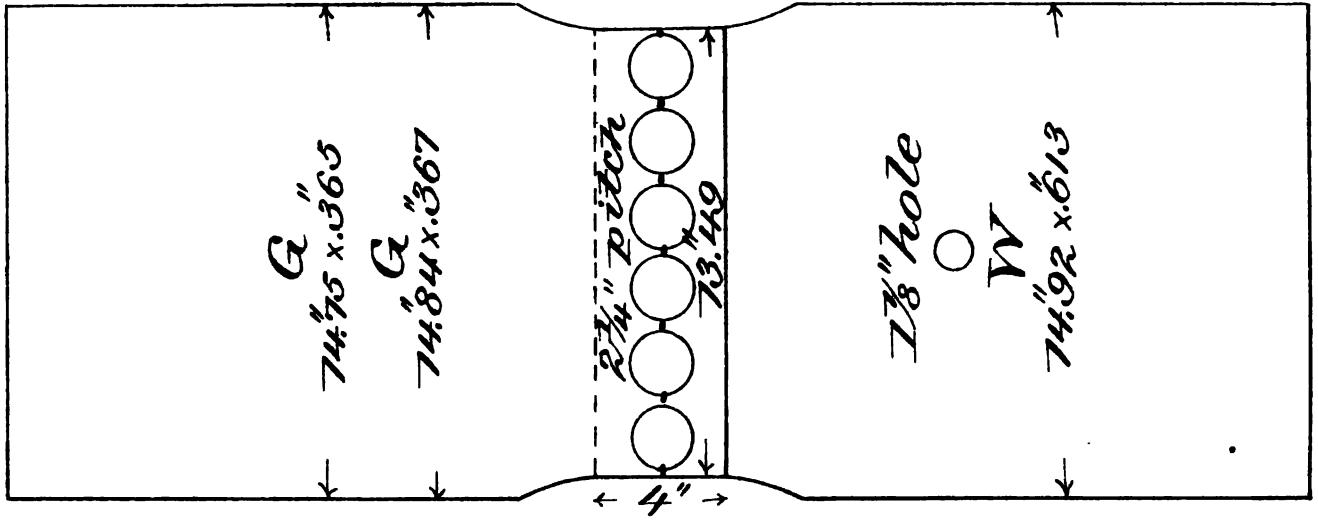
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	31,090
Tension on net section of plate	do....	66,020
Compression on bearing surface of rivets	do....	58,780
Shearing on rivets	do....	20,720

Efficiency of joint, 56.5 per cent.

No. 7466

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	8.269
Plate, net sectional area	do....	4.131
Plate, bearing surface of rivets	do....	4.138
Rivets, shearing area	do....	11.926

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,269	1,000	0.	0.	Initial load.
16,538	2,000	.0001	.....	
24,807	3,000	.0002	.....	
33,076	4,000	.0003	.....	
41,345	5,000	.0005	.0002	
49,614	6,000	.0009	.....	
57,883	7,000	.0019	.....	
66,152	8,000	.0036	.....	
74,421	9,000	.0053	.....	
82,690	10,000	.0069	.0061	
90,959	11,000	.0081	.....	
99,228	12,000	.0095	.....	
107,497	13,000	.0114	.....	
115,766	14,000	.0122	.....	
124,035	15,000	.0127	.0109	
132,304	16,000	.0141	.....	
140,573	17,000	.0151	.....	
148,842	18,000	.0161	.....	
157,111	19,000	.0175	.....	
165,380	20,000	.0194	.0154	
173,649	21,000	.0231	.....	
181,918	22,000	.0257	.....	
190,187	23,000	.0332	.....	
198,456	24,000	.0394	.....	
206,725	25,000	.0555	.0417	
214,994	26,000	.0650	.....	
223,263	27,000	.0770	.....	
231,532	28,000	.0900	.....	
239,801	29,000	.1110	.....	
248,070	30,000	.1400	.....	
256,339	31,000	.17	.....	
264,608	32,000	.21	.....	
272,877	33,000	.29	.....	
274,100	33,150	.38	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slightly lamellar. Open at edges ″.03 each.
Area at fracture (one section), ″.95×″.41=.3895 square inch.
Contraction, 43.5 per cent.
Elongation of rivet-holes, ″.48, ″.48, ″.48, ″.48, ″.53, ″.53.

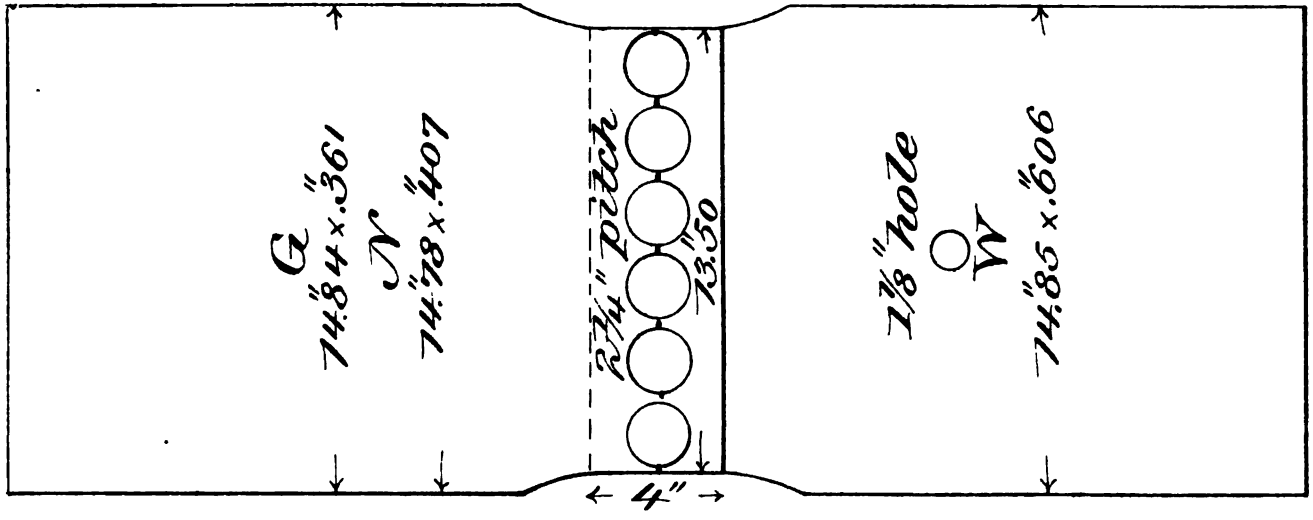
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	33,150
Tension on net section of plate	do....	66,350
Compression on bearing surface of rivets	do....	66,240
Shearing on rivets	do....	22,920

Efficiency of joint, 57.8 per cent.

No. 7467

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	8.181
Plate, net sectional area	do....	4.000
Plate, bearing surface of rivets	do....	4.091
Rivets, shearing area	do....	11.928

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,181	1,000	0.	0.	Initial load.
16,362	2,000	.0001	.....	
24,543	3,000	.0003	.....	
32,724	4,000	.0005	.....	
40,905	5,000	.0009	.0005	
49,086	6,000	.0015	.....	
57,267	7,000	.0039	.....	
65,448	8,000	.0051	.....	
73,629	9,000	.0063	.....	
81,810	10,000	.0084	.0075	
89,991	11,000	.0097	.....	
98,172	12,000	.0105	.....	
106,353	13,000	.0113	.....	
114,534	14,000	.0123	.....	
122,715	15,000	.0133	.0112	
130,896	16,000	.0153	.....	
139,977	17,000	.0169	.....	
147,258	18,000	.0184	.....	
155,439	19,000	.0193	.....	
163,620	20,000	.0203	.0165	
171,801	21,000	.0230	.....	
179,982	22,000	.0270	.....	
188,163	23,000	.0350	.....	
196,344	24,000	.0442	.....	
201,525	25,000	.0535	.0471	
212,706	26,000	.0670	.....	
220,887	27,000	.0790	.....	
229,068	28,000	.0960	.....	
237,249	29,000	.1135	.....	
245,430	30,000	.1378	.1275	
253,611	31,000	.17	.....	
261,792	32,000	.21	.....	
269,973	33,000	.28	.....	
271,000	33,240	.34	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slightly lamellar. Open at edges ".15 and ".05.
Elongation of rivet-holes, ".50, ".48, ".48, ".48, ".48, ".49.
Area of fracture (one section), ".93×".38=.3534 square inch.
Contraction, 48.1 per cent.

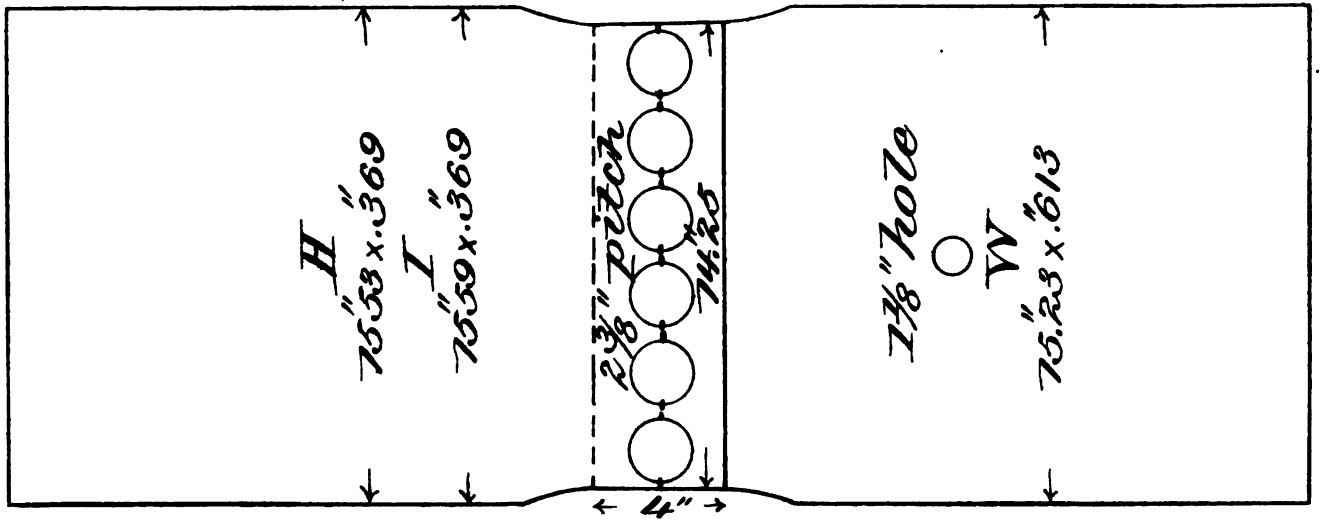
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	33,240
Tension on net section of plate	do....	66,250
Compression on bearing surface of rivets	do....	66,240
Shearing on rivets	do....	22,720

Efficiency of joint, 58.0 per cent.

No. 7468

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	8.735
Plate, net sectional area	do	4.197
Plate, bearing surface of rivets	do	4.188
Rivets, shearing area	do	11.928

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,735	1,000	0.	0.	Initial load.
17,470	2,000	0.	.....	
20,205	3,000	.0007	.....	
34,940	4,000	.0009	.....	
43,675	5,000	.0019	.0012	
52,410	6,000	.0044	.....	
61,145	7,000	.0054	.....	
69,880	8,000	.0063	.....	
78,615	9,000	.0070	.....	
87,350	10,000	.0079	.0060	
96,085	11,000	.0090	.....	
104,820	12,000	.0107	.....	
113,555	13,000	.0131	.....	
122,290	14,000	.0146	.....	
131,025	15,000	.0159	.0121	
139,760	16,000	.0172	.....	
148,495	17,000	.0185	.....	
157,230	18,000	.0201	.....	
165,965	19,000	.0226	.....	
174,700	20,000	.0265	.0201	
183,435	21,000	.0310	.....	
192,170	22,000	.0350	.....	
200,905	23,000	.0421	.....	
209,640	24,000	.0507	.....	
218,375	25,000	.0576	.0487	
227,110	26,000	.0704	.....	
235,845	27,000	.0844	.....	
244,580	28,000	.1000	.....	
253,315	29,000	.1275	.....	
262,050	30,000	.15	.....	
270,785	31,000	.19	.....	
279,520	32,000	.23	.....	
288,255	33,000	.27	.....	
296,990	34,000	.33	.....	
299,300	35,000	.40	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slight lamination. Open at edges ".15 and ".07.
Elongation of rivet-holes, ".55, ".55, ".52, ".52, ".52, ".54.
Area at fracture (one section), 1".05×".39=.4095 square inch.
Contraction, 46.5 per cent.

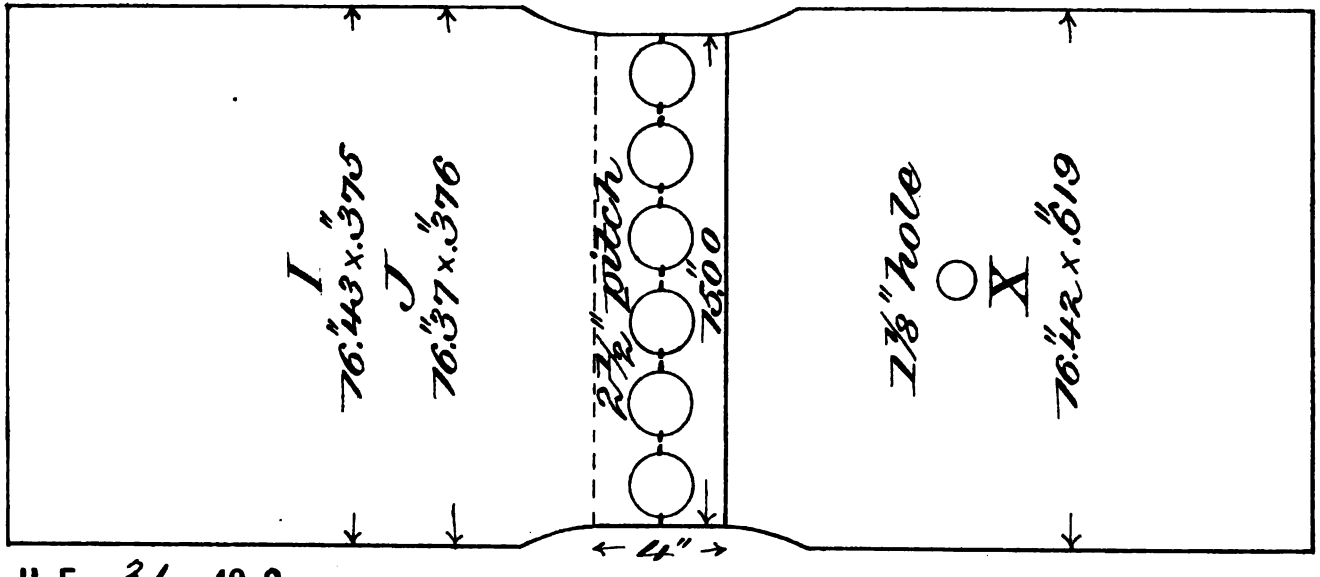
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	34,200
Tension on net section of plate	do	65,110
Compression on bearing surface of rivets	do	72,330
Shearing on rivets	do	25,090

Efficiency of joint, 59.8 per cent.

No. 7470

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	9.285
Plate, net sectional area	do....	5.107
Plate, bearing surface of rivets	do....	4.178
Rivets, shearing area	do....	11,928

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,285	1,000	0.	0.	Initial load.
18,570	2,000	.0000	.....	
27,855	3,000	.0002	.....	
37,140	4,000	.0004	.....	
46,425	5,000	.0008	.0005	
55,710	6,000	.0030	.....	
64,995	7,000	.0040	.....	
74,280	8,000	.0054	.....	
83,565	9,000	.0082	.....	
92,850	10,000	.0090	.0085	
102,135	11,000	.0100	.....	
111,420	12,000	.0110	.....	
120,705	13,000	.0116	.....	
129,990	14,000	.0126	.....	
139,275	15,000	.0137	.0119	
148,560	16,000	.0146	.....	
157,845	17,000	.0161	.....	
167,130	18,000	.0173	.....	
176,415	19,000	.0189	.....	
185,700	20,000	.0202	.0169	
194,985	21,000	.0233	.....	
204,270	22,000	.0263	.....	
213,555	23,000	.0295	.....	
222,840	24,000	.0345	.....	
232,125	25,000	.0468	.0414	
241,410	26,000	.0663	.....	
250,695	27,000	.0783	.....	
259,980	28,000	.0938	.....	
269,265	29,000	.1123	.....	
278,550	30,000	.1373	.....	
287,835	31,000	.17	.....	
297,120	32,000	.20	.....	
306,405	33,000	.24	.....	
315,690	34,000	.29	.....	
324,800	34,980	.41	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky. Open at edges ″.25 and ″.10.
Elongation of rivet-holes, ″.68, ″.62, ″.56, ″.53, ″.53, ″.54.
Area at fracture (one section), 1″.20×″.41=.4920 square inch.
Contraction, 42.1 per cent.

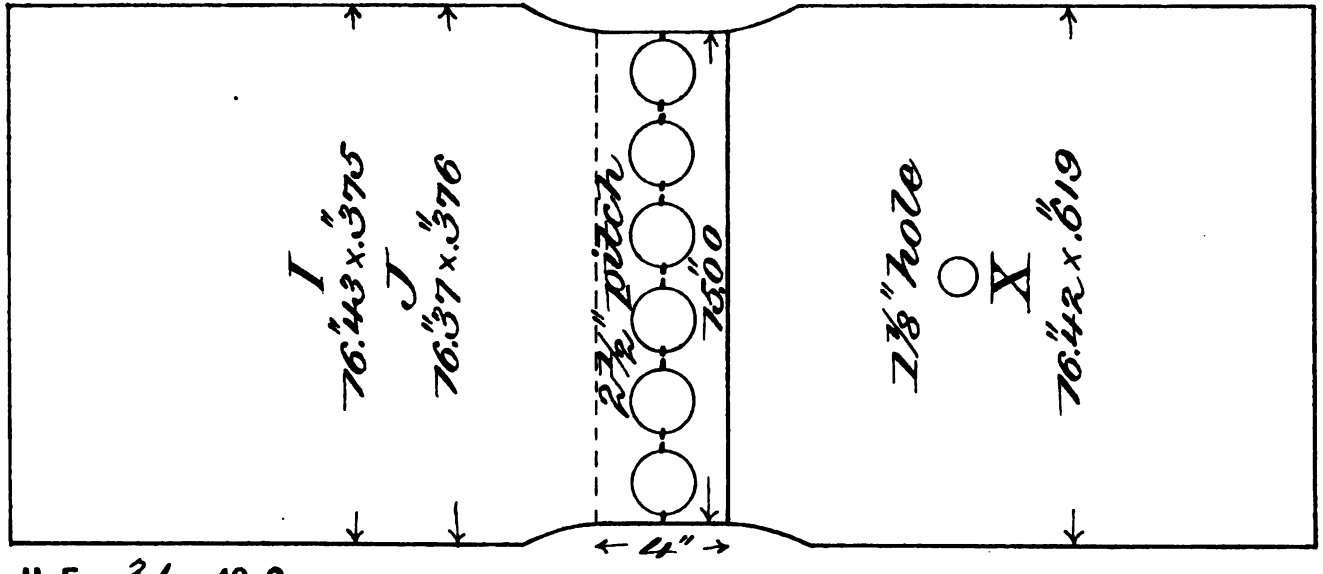
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	34,080
Tension on net section of plate	do....	63,600
Compression on bearing surface of rivets	do....	77,740
Shearing on rivets	do....	27,230

Efficiency of joint, 62.5 per cent.

No. 7470

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	9.285
Plate, net sectional area	do	5.107
Plate, bearing surface of rivets	do	4.178
Rivets, shearing area	do	11,928

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,285	1,000	0.	0.	Initial load.
18,570	2,000	.0000	.....	
27,855	3,000	.0002	.....	
37,140	4,000	.0004	.....	
46,425	5,000	.0008	.0005	
55,710	6,000	.0030	.....	
64,995	7,000	.0040	.....	
74,280	8,000	.0054	.....	
83,565	9,000	.0082	.....	
92,850	10,000	.0090	.0085	
102,135	11,000	.0100	.....	
111,420	12,000	.0110	.....	
120,705	13,000	.0116	.....	
129,990	14,000	.0126	.....	
139,275	15,000	.0137	.0119	
148,560	16,000	.0146	.....	
157,845	17,000	.0161	.....	
167,130	18,000	.0173	.....	
176,415	19,000	.0189	.....	
185,700	20,000	.0202	.0169	
194,985	21,000	.0223	.....	
204,270	22,000	.0263	.....	
213,555	23,000	.0295	.....	
222,840	24,000	.0345	.....	
232,125	25,000	.0468	.0414	
241,410	26,000	.0663	.....	
250,695	27,000	.0783	.....	
259,980	28,000	.0938	.....	
269,265	29,000	.1123	.....	
278,550	30,000	.1373	.....	
287,835	31,000	.17	.....	
297,120	32,000	.20	.....	
306,405	33,000	.24	.....	
315,690	34,000	.29	.....	
324,800	34,980	.41	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky. Open at edges ″.25 and ″.10.
Elongation of rivet-holes, ″.68, ″.62, ″.56, ″.53, ″.53, ″.54.
Area at fracture (one section), 1″.20×″.41=.4920 square inch.
Contraction, 42.1 per cent.

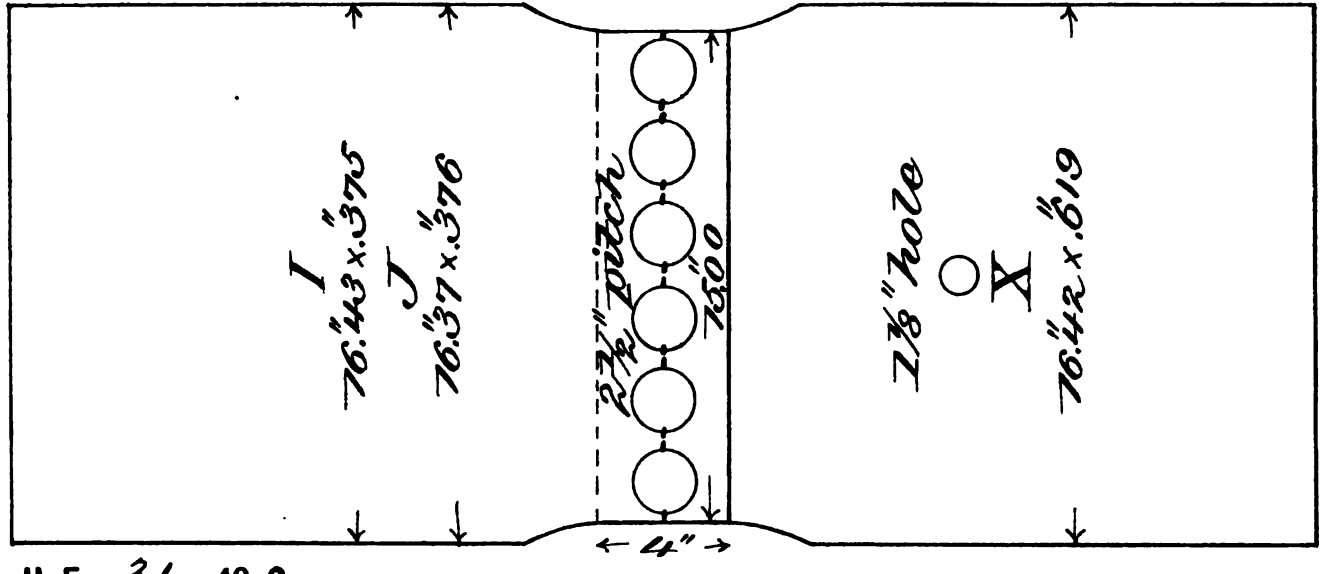
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	34,980
Tension on net section of plate	do	63,600
Compression on bearing surface of rivets	do	77,740
Shearing on rivets	do	27,230

Efficiency of joint, 62.5 per cent.

No. 7470

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	9.285
Plate, net sectional area	do	5.107
Plate, bearing surface of rivets	do	4.178
Rivets, shearing area	do	11,928

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,285	1,000	0.	0.	Initial load.
18,570	2,000	.0000	.....	
27,855	3,000	.0002	.....	
37,140	4,000	.0004	.....	
46,425	5,000	.0008	.0005	
55,710	6,000	.0030	.....	
64,995	7,000	.0040	.....	
74,280	8,000	.0054	.....	
83,565	9,000	.0082	.....	
92,850	10,000	.0090	.0085	
102,135	11,000	.0100	.....	
111,420	12,000	.0110	.....	
120,705	13,000	.0116	.....	
129,990	14,000	.0126	.....	
139,275	15,000	.0137	.0119	
148,560	16,000	.0146	.....	
157,845	17,000	.0161	.....	
167,130	18,000	.0173	.....	
176,415	19,000	.0189	.....	
185,700	20,000	.0202	.0169	
194,985	21,000	.0233	.....	
204,270	22,000	.0263	.....	
213,555	23,000	.0295	.....	
222,840	24,000	.0345	.....	
232,125	25,000	.0468	.0414	
241,410	26,000	.0663	.....	
250,695	27,000	.0783	.....	
259,980	28,000	.0938	.....	
269,265	29,000	.1123	.....	
278,550	30,000	.1373	.....	
287,835	31,000	.17	.....	
297,120	32,000	.20	.....	
306,405	33,000	.24	.....	
315,690	34,000	.29	.....	
324,800	34,980	.41	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky. Open at edges ″.25 and ″.10.
Elongation of rivet-holes, ″.68, ″.62, ″.56, ″.53, ″.53, ″.54.
Area at fracture (one section), 1″.20×″.41=.4920 square inch.
Contraction, 42.1 per cent.

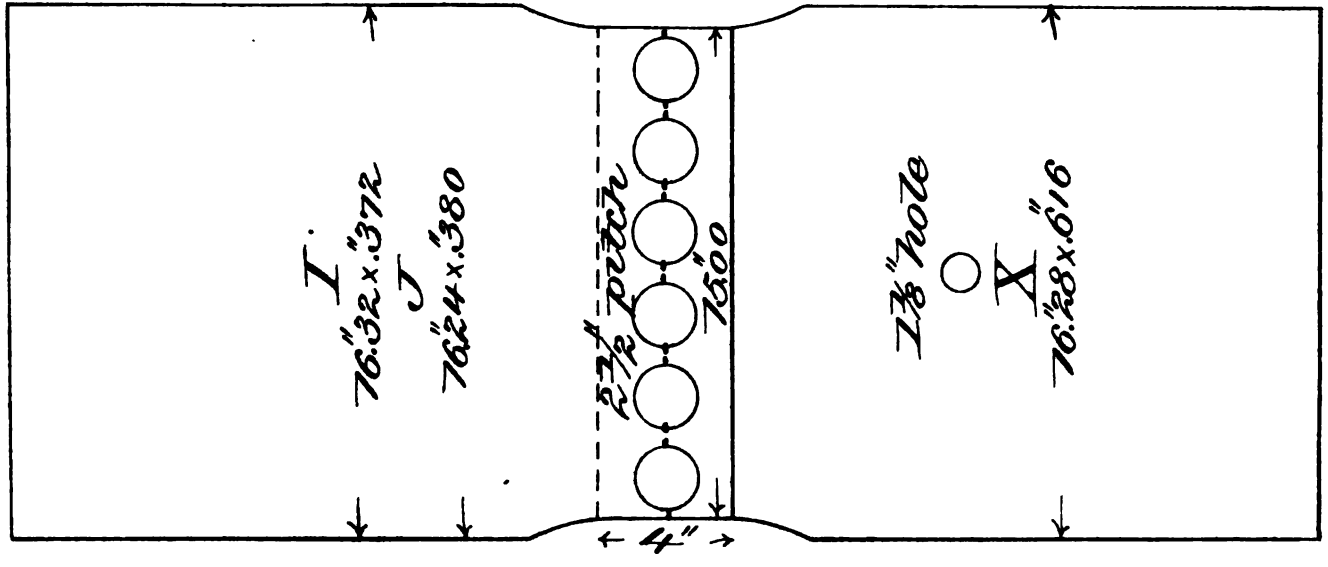
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	34,980
Tension on net section of plate	do	63,600
Compression on bearing surface of rivets	do	77,740
Shearing on rivets	do	27,230

Efficiency of joint, 62.5 per cent.

No. 7471

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	9.240
Plate, net sectional area	do....	5.082
Plate, bearing surface of rivets	do....	4.158
Rivets, shearing area	do....	11.928

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,240	1,000	0.	0.	Initial load.
18,480	2,000	.0001	.....	
27,720	3,000	.0002	.....	
36,960	4,000	.0005	.....	
46,200	5,000	.0009	.0006	
55,440	6,000	.0031	.....	
64,680	7,000	.0051	.....	
73,920	8,000	.0076	.....	
83,160	9,000	.0086	.....	
92,400	10,000	.0100	.0088	
101,640	11,000	.0113	.....	
110,880	12,000	.0123	.....	
120,120	13,000	.0133	.....	
129,360	14,000	.0145	.....	
138,600	15,000	.0161	.0131	
147,840	16,000	.0176	.....	
157,080	17,000	.0190	.....	
166,320	18,000	.0207	.....	
175,560	19,000	.0228	.....	
184,800	20,000	.0250	.0199	
194,040	21,000	.0292	.....	
203,280	22,000	.0338	.....	
212,520	23,000	.0400	.....	
221,760	24,000	.0490	.....	
231,000	25,000	.0620	.0537	
240,240	26,000	.0753	.....	
249,480	27,000	.....	.....	
258,720	28,000	.1095	.....	
267,960	29,000	.14	.....	
277,200	30,000	.16	.....	
286,440	31,000	.19	.....	
295,680	32,000	.23	.....	
304,920	33,000	.28	.....	
314,160	34,000	.32	.....	
321,300	34,770	.46	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slightly lamellar. Open at edges ″.12 and ″.20.
Elongation of rivet-holes, ″.63, ″.57, ″.57, ″.57, ″.57, ″.62.
Area at fracture (one section), 1″.17 × ″.38 = .4446 square inch.
Contraction, 47.5 per cent.

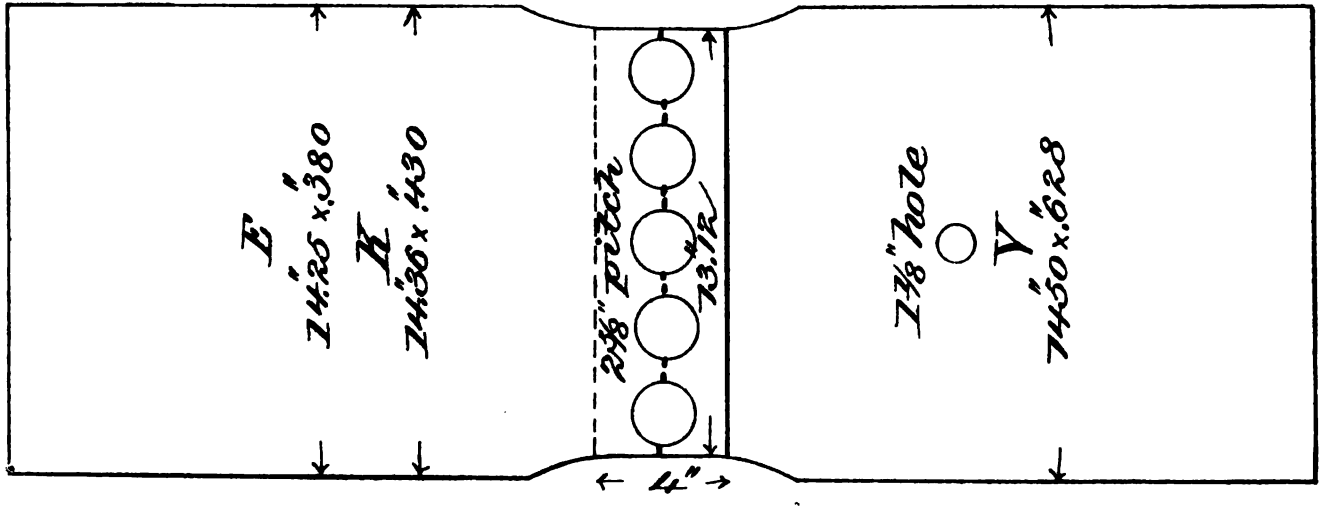
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	34,770
Tension on net section of plate	do....	63,220
Compression on bearing surface of rivets	do....	77,270
Shearing on rivets	do....	26,930

Efficiency of joint, 62.1 per cent.

No. 7472

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	8.239
Plate, net sectional area	do	4.706
Plate, bearing surface of rivets	do	3.533
Rivets, shearing area	do	9.940

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,239	1,000	0.	0.	Initial load.
16,478	2,000	.0001	.....	
24,717	3,000	.0004	.....	
32,956	4,000	.0008	.....	
41,195	5,000	.0010	.0004	
49,434	6,000	.0023	.....	
58,073	7,000	.0047	.....	
65,912	8,000	.0055	.....	
74,151	9,000	.0065	.....	
82,390	10,000	.0079	.0058	
90,629	11,000	.0096	.....	
98,868	12,000	.0113	.....	
107,107	13,000	.0129	.....	
115,346	14,000	.0149	.....	
123,585	15,000	.0166	.0128	
131,824	16,000	.0183	.....	
140,063	17,000	.0197	.....	
148,392	18,000	.0218	.....	
156,541	19,000	.0244	.....	
164,780	20,000	.0268	.0204	
	1,000	.0204	.....	
	2,000	.0204	.....	
	3,000	.0205	.....	
	4,000	.0210	.....	
	5,000	.0212	.....	
	6,000	.0216	.....	
	7,000	.0220	.....	
	8,000	.0222	.....	
	9,000	.0224	.....	
	10,000	.0230	.....	
	11,000	.0234	.....	
	12,000	.0238	.....	
	13,000	.0243	.....	
	14,000	.0246	.....	
	15,000	.0250	.....	
	16,000	.0256	.....	
	17,000	.0260	.....	
	18,000	.0262	.....	
	19,000	.0267	.....	
	20,000	.0273	.....	
173,019	21,000	.0285	.....	
181,258	22,000	.0330	.....	
189,497	23,000	.0412	.....	
197,736	24,000	.0532	.....	
205,975	25,000	.0655	.0557	
214,214	26,000	.0831	.....	
222,453	27,000	.0980	.....	
230,692	28,000	.1175	.....	
238,931	29,000	.13	.....	
247,170	30,000	.16	.....	
255,409	31,000	.18	.....	
263,648	32,000	.21	.....	
271,887	33,000	.27	.....	
280,126	34,000	.30	.....	
288,365	35,000	.36	.....	
296,604	36,000	.47	.....	
299,500	36,350	.58	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, lamellar. Open at edges ″.05 and ″.15.
Elongation of rivet-holes, ″.69, ″.64, ″.61, ″.61, ″.67.
Area at fracture (one section), 1″.28×″.39=.4992 square inch.
Contraction, 47.1 per cent.

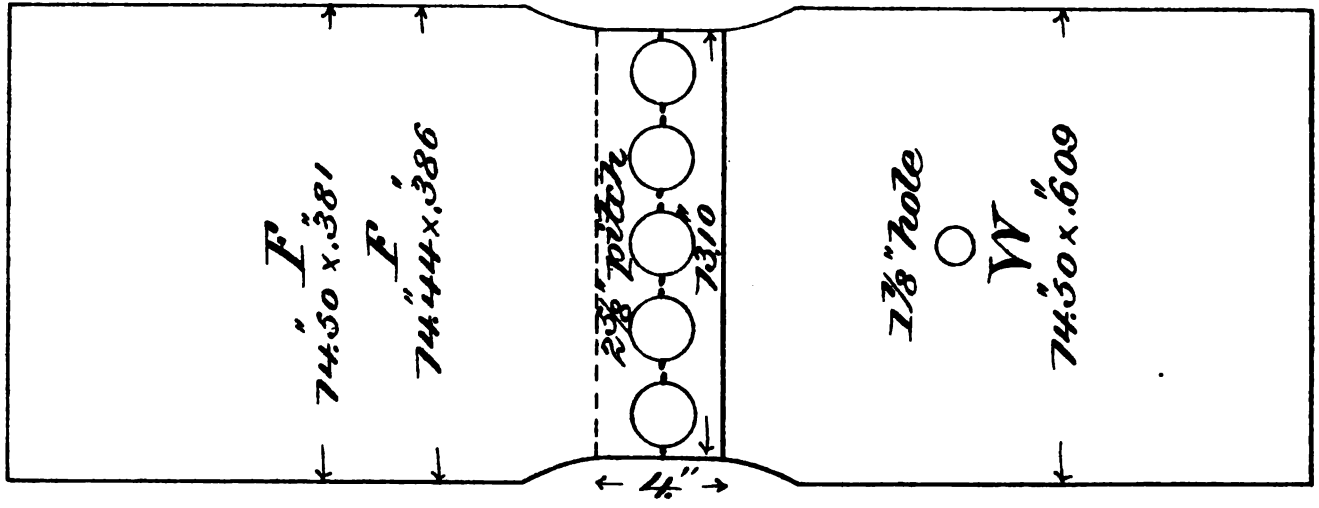
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	36,350
Tension on net section of plate	do	63,640
Compression on bearing surface of rivets	do	84,770
Shearing on rivets	do	30,130

Efficiency of joint, 66.1 per cent.

No. 7473

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	7.978
Plate, net sectional area	do....	4.552
Plate, bearing surface of rivets	do....	3.426
Rivets, shearing area	do....	9.940

[Joint warped; micrometer on the convex side.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
7,978	1,000	0.	0.	Initial load.
15,956	2,000	−.0002	.....	
23,934	3,000	−.0004	.....	
31,912	4,000	+.0001	.....	
39,890	5,000	.0029	.0035	
47,868	6,000	.0037	.....	
55,846	7,000	.0043	.....	
63,824	8,000	.0051	.....	
71,802	9,000	.0069	.....	
79,780	10,000	.0097	.0112	
87,758	11,000	.0116	.....	
95,736	12,000	.0127	.....	
103,714	13,000	.0136	.....	
111,692	14,000	.0142	.....	
119,670	15,000	.0162	.0165	
127,648	16,000	.0196	.....	
135,626	17,000	.0206	.....	
143,604	18,000	.0220	.....	
151,582	19,000	.0242	.....	
159,560	20,000	.0261	.0247	
167,538	21,000	.0297	.....	
175,516	22,000	.0332	.....	
183,494	23,000	.0398	.....	
191,472	24,000	.0498	.....	
199,450	25,000	.0605	.0557	
207,428	26,000	.0720	.....	
215,406	27,000	.0872	.....	
223,384	28,000	.1040	.....	
231,362	29,000	.1230	.....	
239,340	30,000	.1440	.1345	
247,318	31,000	.19	.....	
255,296	32,000	.22	.....	
263,274	33,000	.26	.....	
271,252	34,000	.30	.....	
279,230	35,000	.36	.....	
287,208	36,000	.42	.....	
295,186	37,000	.53	.....	
296,000	37,100	.60	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky. Open at edges ″.15 and ″.12.
Elongation of rivet-holes, ″.72, ″.66, ″.62, ″.63, ″.63.
Area at fracture (one section), 1″.30×″.40=.5200 square inch.
Contraction, 43.0 per cent.

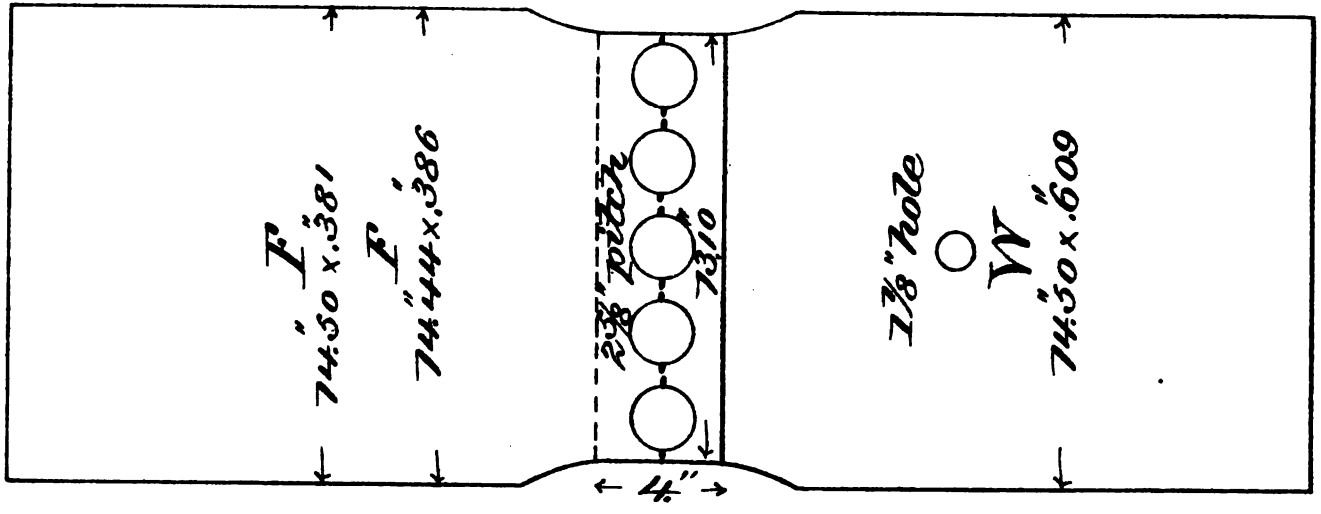
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	37,100
Tension on net section of plate	do....	65,020
Compression on bearing surface of rivets	do....	86,400
Shearing on rivets	do....	29,780

Efficiency of joint, 64.7 per cent.

No. 7473

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	7.978
Plate, net sectional area	do....	4.552
Plate, bearing surface of rivets	do....	3.426
Rivets, shearing area	do....	9.940

[Joint warped; micrometer on the convex side.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
7,078	1,000	0.	0.	Initial load.
15,956	2,000	−.0002	.....	
23,934	3,000	−.0004	.....	
31,912	4,000	+.0001	.....	
39,890	5,000	.0029	.0035	
47,868	6,000	.0037	.....	
55,846	7,000	.0043	.....	
63,824	8,000	.0051	.....	
71,802	9,000	.0069	.....	
79,780	10,000	.0097	.0112	
87,758	11,000	.0116	.....	
95,736	12,000	.0127	.....	
103,714	13,000	.0136	.....	
111,692	14,000	.0142	.....	
119,670	15,000	.0162	.0165	
127,648	16,000	.0196	.....	
135,626	17,000	.0206	.....	
143,604	18,000	.0220	.....	
151,582	19,000	.0242	.....	
159,560	20,000	.0261	.0247	
167,538	21,000	.0297	.....	
175,516	22,000	.0332	.....	
183,494	23,000	.0398	.....	
191,472	24,000	.0498	.....	
199,450	25,000	.0605	.0557	
207,428	26,000	.0720	.....	
215,406	27,000	.0872	.....	
223,384	28,000	.1040	.....	
231,362	29,000	.1230	.....	
239,340	30,000	.1440	.1345	
247,318	31,000	.19	.....	
255,296	32,000	.22	.....	
263,274	33,000	.26	.....	
271,252	34,000	.30	.....	
279,230	35,000	.36	.....	
287,208	36,000	.42	.....	
295,186	37,000	.53	.....	
296,000	37,100	.60	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky. Open at edges ″.15 and ″.12.
Elongation of rivet-holes, ″.72, ″.66, ″.62, ″.63, ″.63.
Area at fracture (one section), 1″.30×″.40=.5200 square inch.
Contraction, 43.0 per cent.

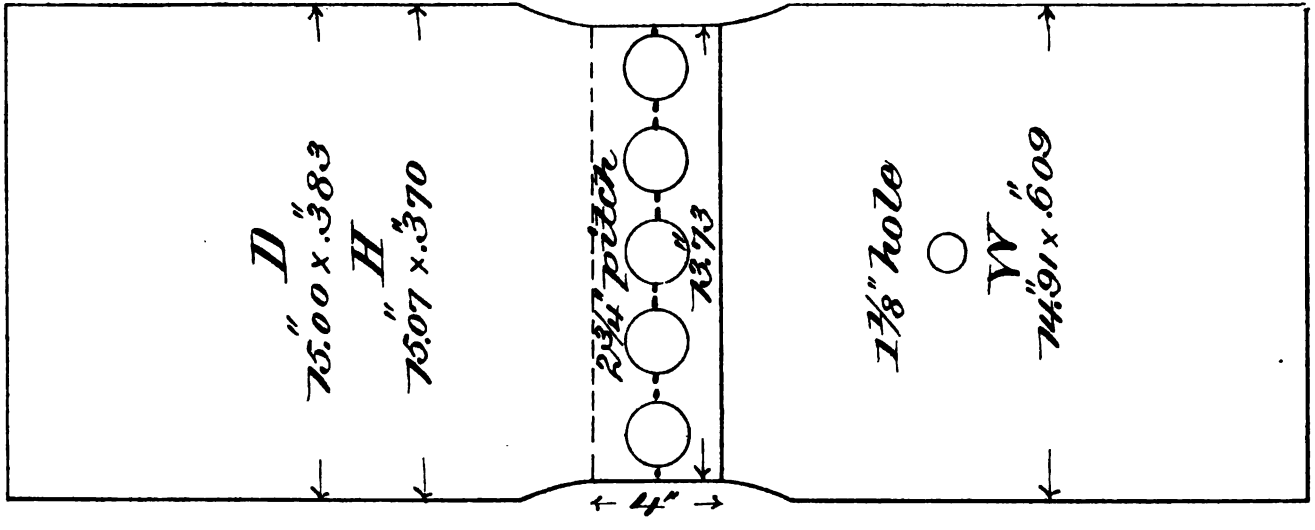
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	37,100
Tension on net section of plate	do....	65,020
Compression on bearing surface of rivets	do....	86,400
Shearing on rivets	do....	29,780

Efficiency of joint, 64.7 per cent.

No. 7474

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	8.362
Plate, net sectional area	do....	4.926
Plate, bearing surface of rivets	do....	8.426
Rivets, shearing area	do....	9.940

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,362	1,000	0.	0.	Initial load.
16,724	2,000	.0000	.....	
25,086	3,000	.0002	.....	
33,448	4,000	.0003	.....	
41,810	5,000	.0030	.0032	
50,172	6,000	.0043	.....	
58,534	7,000	.0051	.....	
66,896	8,000	.0066	.....	
75,258	9,000	.0079	.....	
83,620	10,000	.0092	.0084	
91,982	11,000	.0109	.....	
100,344	12,000	.0125	.....	
108,706	13,000	.0137	.....	
117,068	14,000	.0146	.....	
125,430	15,000	.0159	.0129	
133,792	16,000	.0172	.....	
142,154	17,000	.0187	.....	
150,516	18,000	.0207	.....	
158,878	19,000	.0238	.....	
167,240	20,000	.0294	.0240	
175,602	21,000	.0342	.....	
183,964	22,000	.0392	.....	
192,326	23,000	.0432	.....	
200,688	24,000	.0507	.....	
209,050	25,000	.0595	.0324	
217,412	26,000	.0725	.....	
225,774	27,000	.0846	.....	
234,136	28,000	.1022	.....	
242,498	29,000	.1235	.....	
250,860	30,000	.14	.....	
259,222	31,000	.17	.....	
267,584	32,000	.20	.....	
275,946	33,000	.24	.....	
284,308	34,000	.28	.....	
292,670	35,000	.32	.....	
301,032	36,000	.38	.....	
309,394	37,000	.46	.....	
317,756	38,000	.57	.....	
319,000	38,150	.62	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky.
Area at fracture (one section), 1″.39 × ″.40 = .5560 square inch.
Contraction, 43.8 per cent.

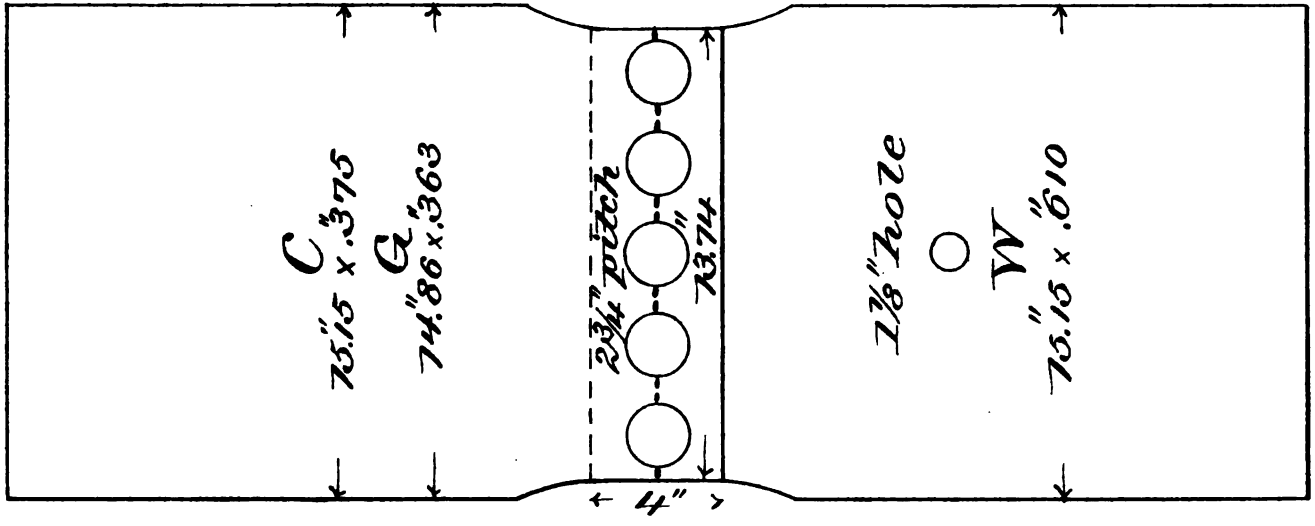
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	38,150
Tension on net section of plate	do....	64,630
Compression on bearing surface of rivets	do....	93,110
Shearing on rivets	do....	82,690

Efficiency of joint, 66.5 per cent.

No. 7475

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	8.381
Plate, net sectional area	do....	4.950
Plate, bearing surface of rivets	do....	3.431
Rivets, shearing area	do....	9.940

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,381	1,000	0.	0.	Initial load.
16,761	2,000	−.0002	.....	
25,143	3,000	.0000	.....	
33,524	4,000	.0004	.....	
41,905	5,000	.0022	.0014	
50,286	6,000	.0048	.....	
58,667	7,000	.0063	.....	
67,048	8,000	.0071	.....	
75,429	9,000	.0083	.....	
83,810	10,000	.0097	.0073	
92,191	11,000	.0112	.....	
100,572	12,000	.0126	.....	
108,953	13,000	.0144	.....	
117,334	14,000	.0157	.....	
125,715	15,000	.0169	.0122	
134,096	16,000	.0190	.....	
142,474	17,000	.0205	.....	
150,858	18,000	.0214	.....	
159,239	19,000	.0225	.....	
167,620	20,000	.0240	.0178	
176,001	21,000	.0268	.....	
184,382	22,000	.0285	.....	
192,763	23,000	.0307	.....	
201,144	24,000	.0350	.....	
209,525	25,000	.0510	.0400	
217,906	26,000	.0715	.....	
226,287	27,000	.0860	.....	
234,668	28,000	.1035	.....	
243,049	29,000	.1230	.....	
251,430	30,000	.14	.....	
259,811	31,000	.17	.....	
268,192	32,000	.19	.....	
276,573	33,000	.22	.....	
284,954	34,000	.27	.....	
293,335	35,000	.31	.....	
301,716	36,000	.37	.....	
310,097	37,000	.43	.....	
318,478	38,000	.52	.....	
319,500	38,120	.56	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, lamellar. Open at edges ″.10 and ″.35.
Elongation of rivet-holes, ″.72, ″.70, ″.70, ″.74, ″.82.
Area at fracture (one section), 1″.38×″.37=.5106 square inch.
Contraction, 48.4 per cent.

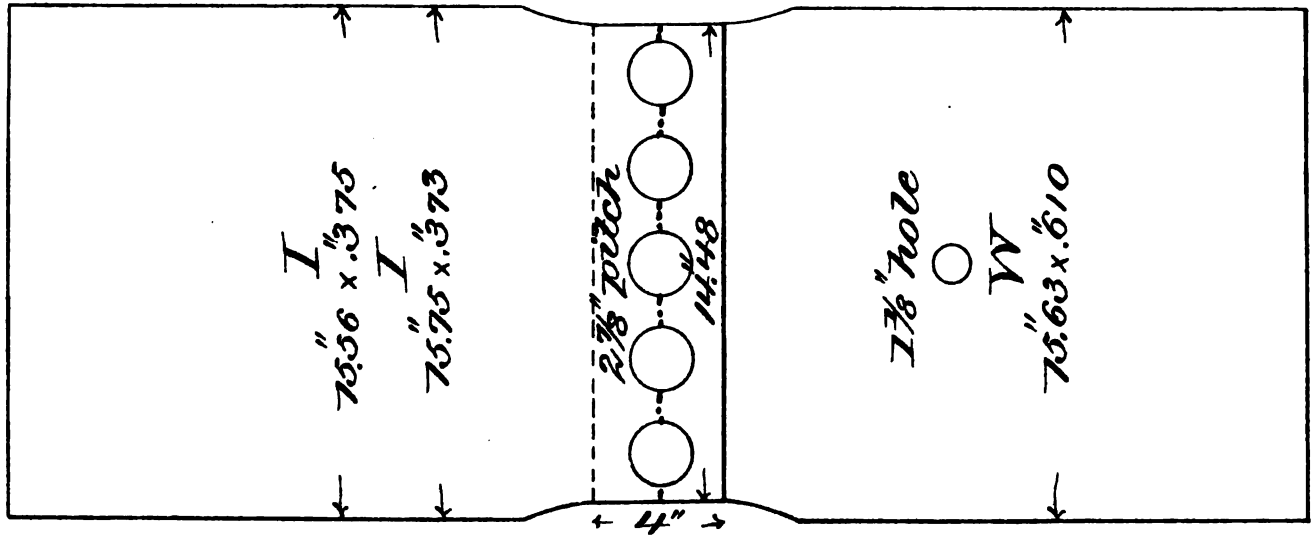
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	38,120
Tension on net section of plate	do....	64,540
Compression on bearing surface of rivets	do....	93,120
Shearing on rivets	do....	32,140

Efficiency of joint, 66.5 per cent.

No. 7476

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	8.833
Plate, net sectional area	do....	5.402
Plate, bearing surface of rivets	do....	8.431
Rivets, shearing area	do....	9.940

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,833	1,000	0.	0.	Initial load.
17,666	2,000	.0003	.....	
26,499	3,000	.0005	.....	
35,332	4,000	.0010	.....	
44,165	5,000	.0025	.0019	
52,998	6,000	.0042	.....	
61,831	7,000	.0064	.....	
70,664	8,000	.0079	.....	
79,497	9,000	.0092	.....	
88,330	10,000	.0107	.0084	
97,163	11,000	.0123	.....	
105,996	12,000	.0135	.....	
114,829	13,000	.0151	.....	
123,662	14,000	.0166	.....	
132,495	15,000	.0184	.0144	
141,328	16,000	.0206	.....	
150,161	17,000	.0222	.....	
158,994	18,000	.0239	.....	
167,827	19,000	.0255	.....	
176,660	20,000	.0282	.0205	
185,493	21,000	.0314	.....	
194,326	22,000	.0357	.....	
203,159	23,000	.0449	.....	
211,992	24,000	.0559	.....	
220,825	25,000	.0714	.0606	
229,658	26,000	.0898	.....	
238,491	27,000	.1054	.....	
247,324	28,000	.1219	.....	
256,157	29,000	.14	.....	
264,990	30,000	.17	.....	
273,823	31,000	.19	.....	
282,656	32,000	.23	.....	
291,489	33,000	.27	.....	
300,322	34,000	.31	.....	
309,155	35,000	.37	.....	
317,988	36,000	.42	.....	
326,821	37,000	.50	.....	
335,654	38,000	.61	.....	
341,100	38,620	.75	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky. Open at middle ″.20.
Elongation of rivet-holes, ″.86, ″.91, ″.96, 1″.01, 1″.01.
Area at fracture (one section), 1.″48×″.38=.5624 square inch.
Contraction, 47.3 per cent.

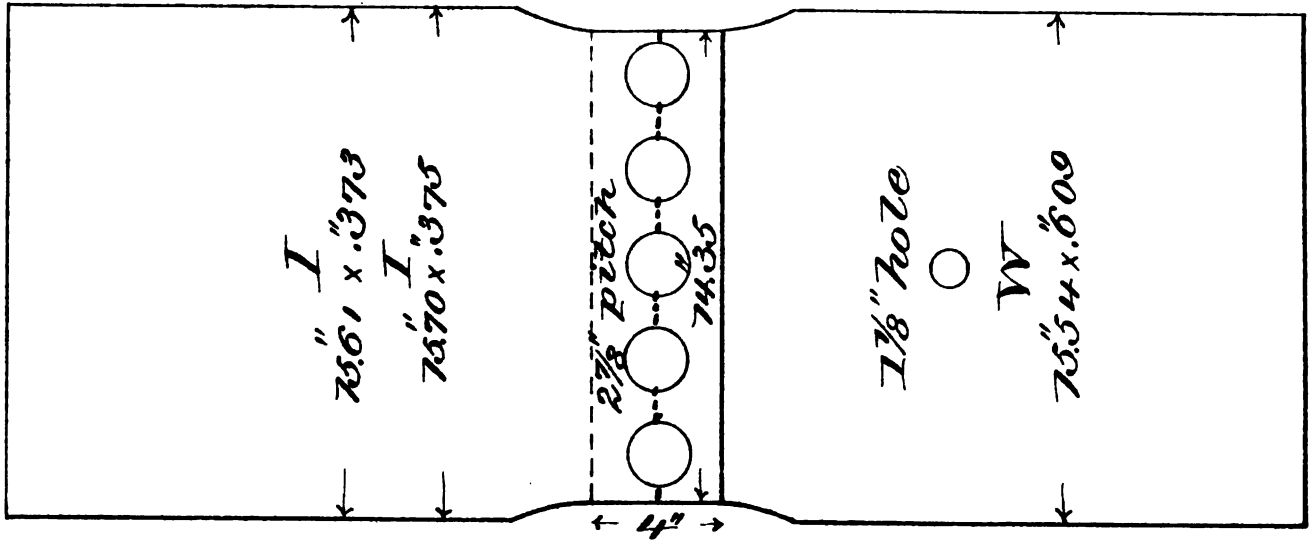
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	38,620
Tension on net section of plate	do....	63,140
Compression on bearing surface of rivets	do....	99,410
Shearing on rivets	do....	34,310

Efficiency of joint, 67.4 per cent.

No. 7477

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	8.739
Plate, net sectional area	do....	5.313
Plate, bearing surface of rivets	do....	3.426
Rivets, shearing area	do....	9.940

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,739	1,000	0.	0.	Initial load.
17,478	2,000	.0002	.....	
26,217	3,000	.0005	.....	
34,956	4,000	.0008	.....	
43,695	5,000	.0015	.0010	
52,434	6,000	.0034	.....	
61,173	7,000	.0059	.....	
69,912	8,000	.0077	.....	
78,651	9,000	.0098	.....	
87,390	10,000	.0114	.0095	
96,129	11,000	.0130	.....	
104,868	12,000	.0142	.....	
113,607	13,000	.0158	.....	
122,346	14,000	.0174	.....	
131,085	15,000	.0188	.0155	
139,824	16,000	.0206	.....	
148,563	17,000	.0219	.....	
157,302	18,000	.0230	.....	
166,041	19,000	.0250	.....	
174,780	20,000	.0272	.0213	
183,519	21,000	.0327	.....	
192,258	22,000	.0411	.....	
200,997	23,000	.0526	.....	
209,736	24,000	.0671	.....	
218,475	25,000	.0826	.0730	
227,214	26,000	.1000	.....	
235,953	27,000	.1170	.....	
244,692	28,000	.135	.....	
253,431	29,000	.17	.....	
262,170	30,000	.19	.....	
270,909	31,000	.21	.....	
279,648	32,000	.24	.....	
288,387	33,000	.29	.....	
297,126	34,000	.33	.....	
305,865	35,000	.39	.....	
314,604	36,000	.46	.....	
323,343	37,000	.53	.....	
332,082	38,000	.67	.....	
333,800	38,180	.73	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky Open at middle ″.12.
Elongation of rivet-holes, ″.78, ″.78, ″.78, ″.84, ″.86.
Area at fracture (one section), 1″.50 × ″.38 = .5700 square inch.
Contraction, 46.5 per cent.

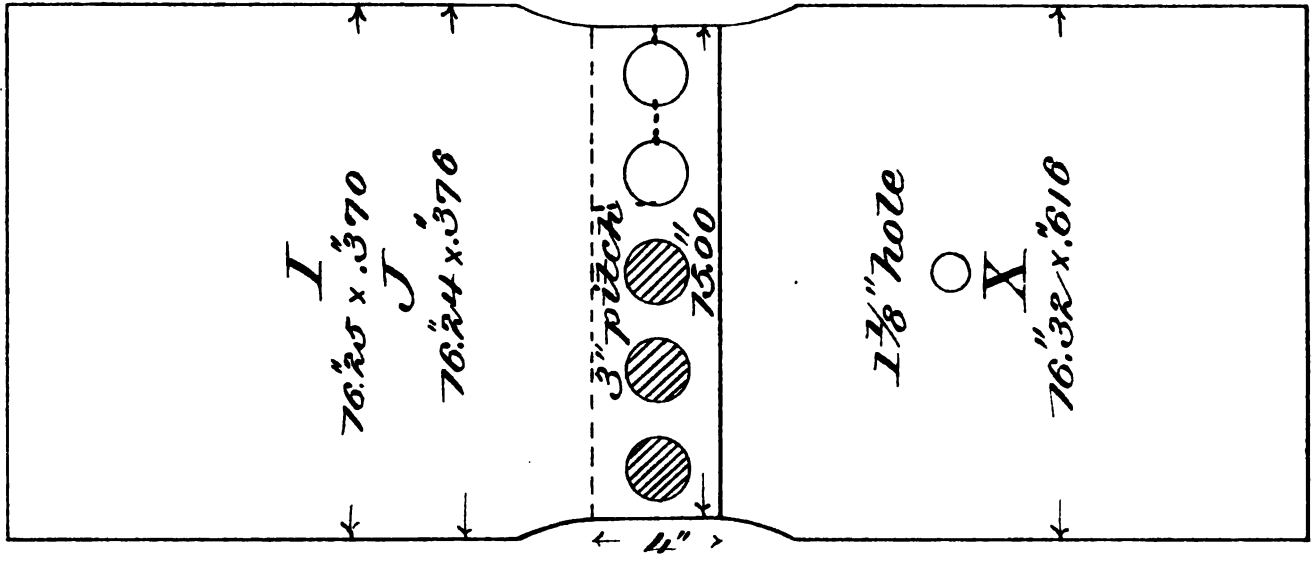
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	38,180
Tension on net section of plate	do....	62,330
Compression on bearing surface of rivets	do....	97,430
Shearing on rivets	do....	33,580

Efficiency of joint, 66.6 per cent.

No. 1478

5/8" steel plate



H Ex 31 ... 49 2

Areas.

Plate, gross sectional area	square inches	9.240
Plate, net sectional area	do	5.775
Plate, bearing surface of rivets	do	3.465
Rivets, shearing area	do	9.940

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,240	1,000	0.	0.	Initial load.
18,480	2,000	.0003	.....	
27,720	3,000	.0007	.....	
36,960	4,000	.0016	.....	
46,200	5,000	.0072	.0062	
55,440	6,000	.0085	.....	
64,680	7,000	.0106	.....	
73,920	8,000	.0127	.....	
83,160	9,000	.0140	.....	
92,400	10,000	.0156	.0132	
101,640	11,000	.0180	.....	
110,880	12,000	.0194	.....	
120,120	13,000	.0207	.....	
129,360	14,000	.0223	.....	
138,600	15,000	.0240	.0187	
147,840	16,000	.0260	.....	
157,080	17,000	.0281	.....	
166,320	18,000	.0293	.....	
175,560	19,000	.0306	.....	
184,800	20,000	.0327	.0254	
194,040	21,000	.0371	.....	
203,280	22,000	.0401	.....	
212,520	23,000	.0452	.....	
221,760	24,000	.0586	.....	
231,000	25,000	.0860	.0758	
240,240	26,000	.1091	.....	
249,480	27,000	.1294	.....	
258,720	28,000	.16	.....	
267,960	29,000	.20	.....	
277,200	30,000	.22	.....	
286,440	31,000	.27	.....	
295,680	32,000	.30	.....	
304,920	33,000	.34	.....	
314,160	34,000	.41	.....	
323,400	35,000	.48	.....	
332,640	36,000	.58	.....	
341,880	37,000	.67	.....	
351,120	38,000	.78	.....	
355,600	38,480	.86	.....	Tensile strength.

Sheared three rivets and fractured the plate across two sections, and then tore out to edge of lap.

Area at fracture (one section), 1″.61 × ″.39 = .6279 square inch.

Contraction, 45.6 per cent.

Elongation of rivet-holes (end ″.55, ″.64, middle ″.70; sheared rivets in these holes), ″.95, ″.90.

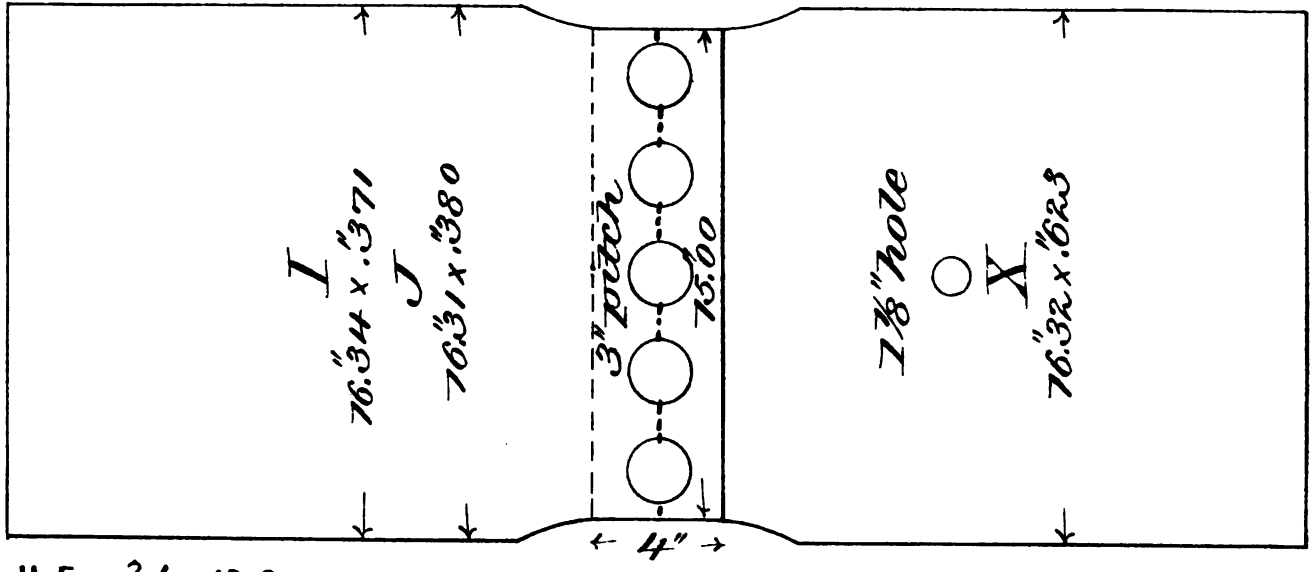
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	38,480
Tension on net section of plate	do	61,570
Compression on bearing surface of rivets	do	102,630
Shearing on rivets	do	35,770

Efficiency of joint, 68.7 per cent.

No. 7479

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	9.345
Plate, net sectional area	do....	5.841
Plate, bearing surface of rivets	do....	3.504
Rivets, shearing area	do....	9.940

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,345	1,000	0.	0.	Initial load.
18,690	2,000	.0002	.....	
28,035	3,000	.0004	.....	
37,380	4,000	.0008	.....	
46,725	5,000	.0013	.0008	
56,070	6,000	.0023	.....	
65,415	7,000	.0039	.....	
74,760	8,000	.0055	.....	
84,105	9,000	.0075	.....	
93,450	10,000	.0093	.0076	
102,795	11,000	.0113	.....	
112,140	12,000	.0126	.....	
121,485	13,000	.0133	.....	
130,830	14,000	.0143	.....	
140,175	15,000	.0156	.0116	
149,520	16,000	.0176	.....	
158,865	17,000	.0194	.....	
168,210	18,000	.0211	.....	
177,555	19,000	.0227	.....	
186,900	20,000	.0254	.0189	
196,245	21,000	.0290	.....	
205,590	22,000	.0370	.....	
214,935	23,000	.0545	.....	
224,280	24,000	.0720	.....	
233,625	25,000	.0892	.0790	
242,970	26,000	.1103	.....	
252,315	27,000	.1253	.....	
261,660	28,000	.16	.....	
271,005	29,000	.18	.....	
280,350	30,000	.20	.....	
289,695	31,000	.23	.....	
299,040	32,000	.28	.....	
308,385	33,000	.33	.....	
317,730	34,000	.39	.....	
327,075	35,000	.46	.....	
336,420	36,000	.55	.....	
345,765	37,000	.65	.....	
355,110	38,000	.78	.....	
358,950	38,410	.92	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slightly lamellar. Open at edges ″.20 and ″.13.
Elongation of rivet-holes, ″.94, ″.90, ″.89, ″.95, 1″.02.
Area at fracture (one section), 1″.65×″.40=.6600 square inch.
Contraction, 43.4 per cent.

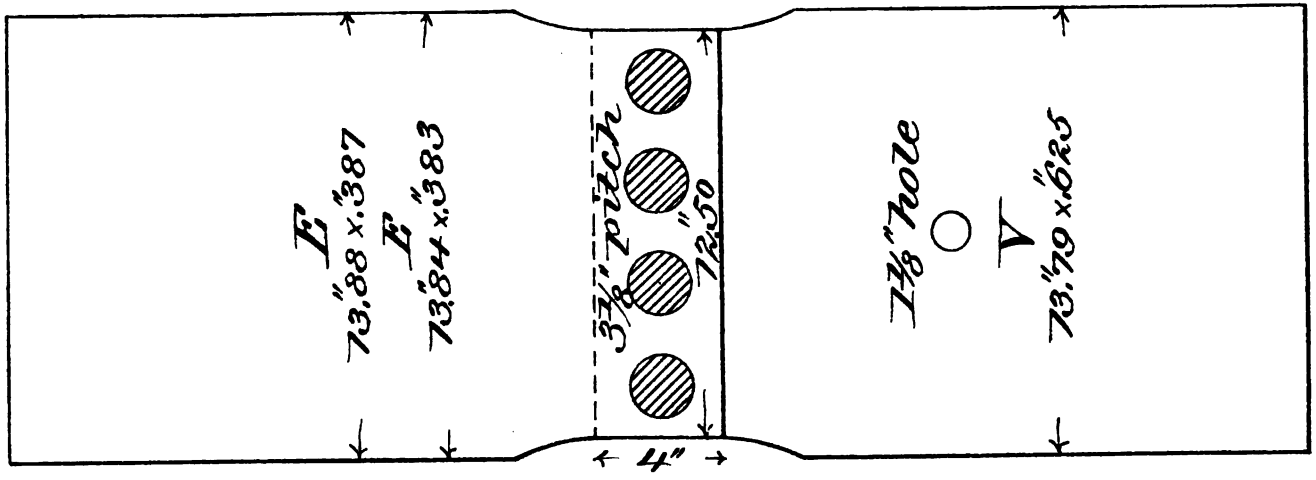
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	38,410
Tension on net section of plate	do....	61,430
Compression on bearing surface of rivets	do....	102,440
Shearing on rivets	do....	36,110

Efficiency of joint, 68.6 per cent.

No. 7480

5/8 "steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	7.813
Plate, net sectional area	do....	5.000
Plate, bearing surface of rivets	do....	2.813
Rivets, shearing area	do....	7.952

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
7,813	1,000	0.	0.	Initial load.
15,626	2,000	.0000	.....	
23,439	3,000	.0001	.....	
31,252	4,000	.0004	.....	
39,065	5,000	.0057	.0054	
46,878	6,000	.0069	.....	
54,691	7,000	.0079	.....	
62,504	8,000	.0087	.....	
70,317	9,000	.0099	.....	
78,130	10,000	.0109	.0099	
85,943	11,000	.0128	.....	
93,756	12,000	.0142	.....	
101,569	13,000	.0157	.....	
109,382	14,000	.0172	.....	
117,195	15,000	.0187	.0156	
125,008	16,000	.0205	.....	
132,821	17,000	.0217	.....	
140,634	18,000	.0230	.....	
148,447	19,000	.0247	.....	
156,260	20,000	.0270	.0210	
164,073	21,000	.0315	.....	
171,886	22,000	.0365	.....	
179,699	23,000	.0460	.....	
187,512	24,000	.0653	.....	
195,325	25,000	.0930	.0834	
203,138	26,000	.12	.....	
210,951	27,000	.15	.....	
218,764	28,000	.17	.....	
226,577	29,000	.20	.....	
234,390	30,000	.22	.....	
242,203	31,000	.27	.....	
250,016	32,000	.30	.....	
257,829	33,000	.36	.....	
265,642	34,000	.44	.....	
273,455	35,000	.52	.....	
281,268	36,000	.60	.....	
289,081	37,000	.70	.....	
291,800	37,340	.77	.....	Tensile strength.

Sheared the rivets.

Rivet at edge A sheared first, followed by the others in succession.

Elongation of rivet-holes, ^{A}".49, ".51, ".56, ^{B}".63.

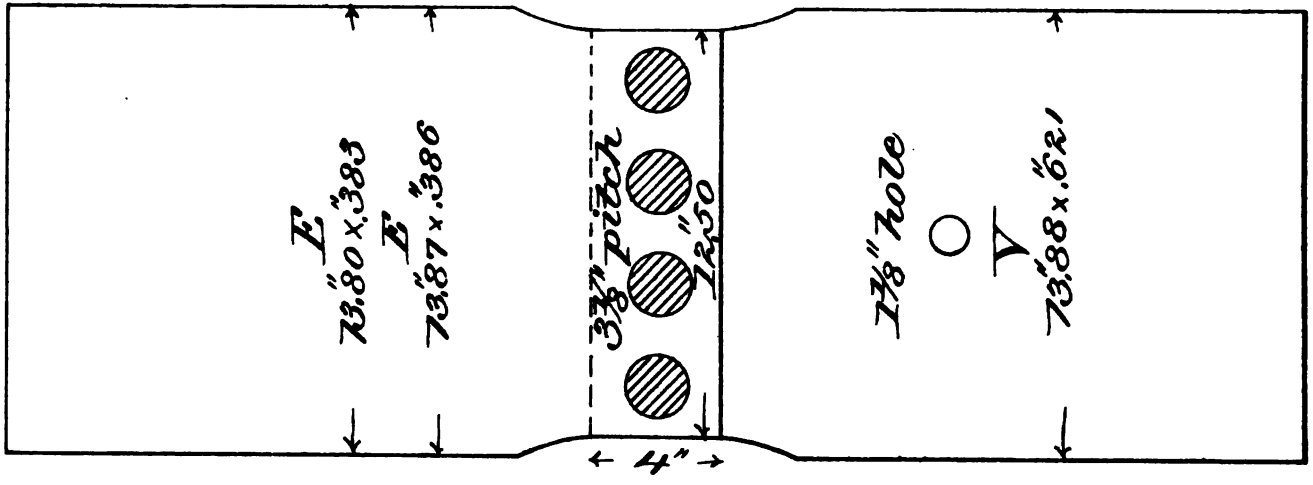
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	37,340
Tension on net section of plate	do....	58,360
Compression on bearing surface of rivets	do....	103,730
Shearing on rivets	do....	86,690

Efficiency of joint, 67.9 per cent.

No. 7481

5/8" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	7.763
Plate, net sectional area	do....	4.968
Plate, bearing surface of rivets	do....	2.795
Rivets, shearing area	do....	7.952

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
7,763	1,000	0.	0.	Initial load.
15,526	2,000	.0002	.....	
23,289	3,000	.0004	.....	
31,052	4,000	.0007	.....	
38,815	5,000	.0039	.0036	
46,578	6,000	.0058	.....	
54,341	7,000	.0071	.....	
62,104	8,000	.0089	.....	
69,867	9,000	.0100	.....	
77,630	10,000	.0112	.0095	
85,393	11,000	.0134	.....	
93,156	12,000	.0148	.....	
100,919	13,000	.0162	.....	
108,682	14,000	.0176	.....	
116,445	15,000	.0193	.0156	
124,208	16,000	.0211	.....	
131,971	17,000	.0226	.....	
139,734	18,000	.0239	.....	
147,497	19,000	.0262	.....	
155,260	20,000	.0290	.0234	
163,023	21,000	.0359	.....	
170,786	22,000	.0447	.....	
178,549	23,000	.0611	.....	
186,312	24,000	.0800	.....	
194,075	25,000	.0980	.0884	
201,838	26,000	.1225	.....	
209,601	27,000	.13	.....	
217,364	28,000	.17	.....	
225,127	29,000	.19	.....	
232,890	30,000	.22	.....	
240,653	31,000	.26	.....	
248,416	32,000	.30	.....	
256,179	33,000	.37	.....	
263,942	34,000	.43	.....	
271,705	35,000	.50	.....	
279,468	36,000	.60	.....	
287,231	37,000	.71	.....	
294,994	38,000	.86	.....	
298,400	38,440	1.00	.....	Tensile strength.

Sheared the rivets.
Elongation of rivet-holes, ".64, ".68, ".73, ".83.

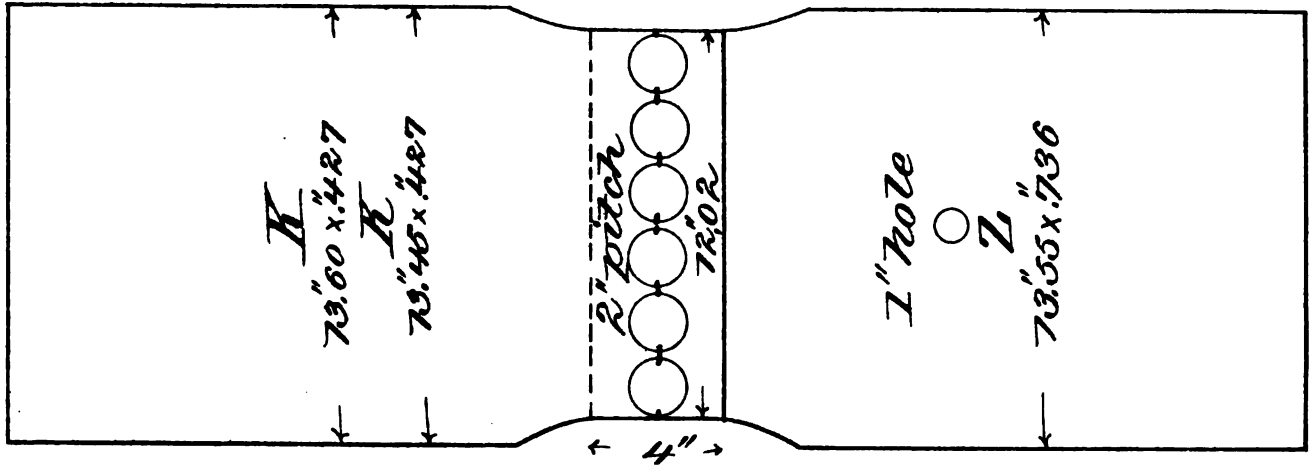
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	38,440
Tension on net section of plate	do....	60,060
Compression on bearing surface of rivets	do....	106,760
Shearing on rivets	do....	37,520

Efficiency of joint, 69.9 per cent.

No. 1482

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	8.847
Plate, net sectional area	do....	4.431
Plate, bearing surface of rivets	do....	4.416
Rivets, shearing area	do....	2.425

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,847	1,000	0.	0.	Initial load.
17,694	2,000	.0013	.....	
26,541	3,000	.0005	.....	
35,388	4,000	.0039	.....	
44,235	5,000	.0063	.0059	
53,082	6,000	.0079	.....	
61,929	7,000	.0093	.....	
70,776	8,000	.0105	.....	
79,623	9,000	.0127	.....	
88,470	10,000	.0144	.0124	
97,317	11,000	.0163	.....	
106,164	12,000	.0183	.....	
115,011	13,000	.0194	.....	
123,858	14,000	.0209	.....	
132,705	15,000	.0215	.0175	
141,552	16,000	.0238	.....	
150,399	17,000	.0248	.....	
159,246	18,000	.0270	.....	
168,093	19,000	.0300	.....	
176,940	20,000	.0360	.0287	
185,787	21,000	.0447	.....	
194,634	22,000	.0520	.....	
203,481	23,000	.0615	.....	
212,328	24,000	.0715	.....	
221,175	25,000	.0840	.0742	
230,022	26,000	.1005	.....	
238,869	27,000	.12	.....	
247,716	28,000	.16	.....	
256,563	29,000	.18	.....	
265,410	30,000	.20	.....	
274,257	31,000	.27	.....	
283,000	31,990	.36	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slightly lamellar. Open at edges ".03 and ".08.
Elongation of rivet-holes, ".53 each.
Area at fracture (one section), ".78×".44=.3432 square inch.
Contraction, 53.4 per cent.

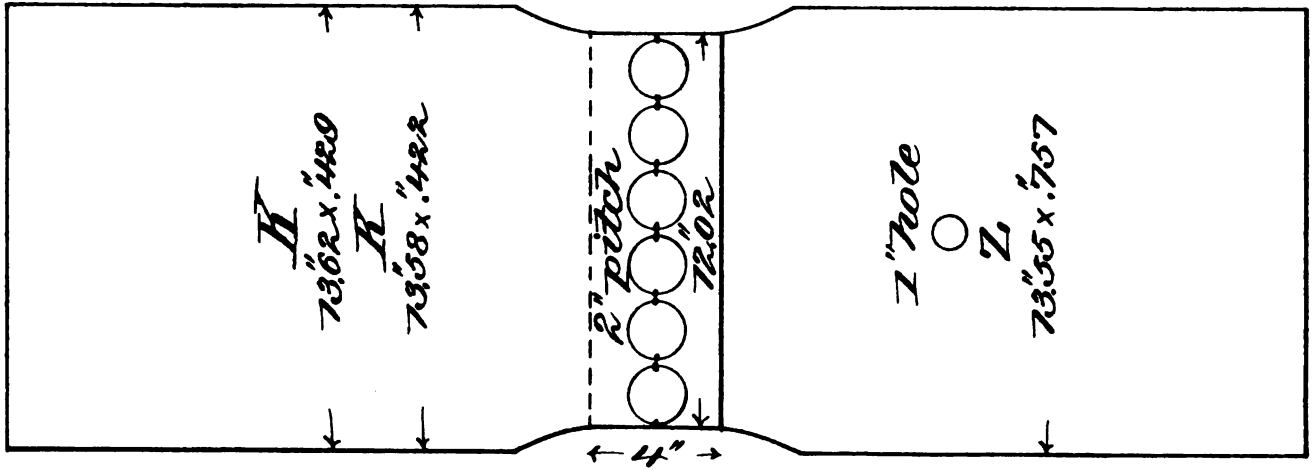
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	31,990
Tension on net section of plate	do....	63,570
Compression on bearing surface of rivets	do....	64,000
Shearing on rivets	do....	30,030

Efficiency of joint, 54.2 per cent.

No. 7483

3/4" steel plate



H Ex 31 492

Areas.

Plate, gross sectional area	square inches..	9.099
Plate, net sectional area	do....	4.557
Plate, bearing surface of rivets	do....	4.542
Rivets, shearing area	do....	9.425

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,099	1,000	0.	0.	Initial load.
18,198	2,000	.0000	.....	
27,297	3,000	.0001	.....	
36,396	4,000	.0002	.....	
45,495	5,000	.0006	.0003	
54,594	6,000	.0038	.....	
63,693	7,000	.0056	.....	
72,792	8,000	.0065	.....	
81,891	9,000	.0074	.....	
90,990	10,000	.0082	.0072	
100,089	11,000	.0096	.....	
109,188	12,000	.0107	.....	
118,287	13,000	.0121	.....	
127,386	14,000	.0139	.....	
136,485	15,000	.0155	.0140	
145,584	16,000	.0171	.....	
154,683	17,000	.0181	.....	
163,782	18,000	.0193	.....	
172,881	19,000	.0205	.....	
181,980	20,000	.0223	.0175	
191,079	21,000	.0258	.....	
200,178	22,000	.0345	.....	
209,277	23,000	.0422	.....	
218,376	24,000	.0552	.....	
227,475	25,000	.0724	.0038	
236,574	26,000	.0895	.....	
245,673	27,000	.1053	.....	
254,772	28,000	.1260	.....	
263,871	29,000	.15	.....	
272,970	30,000	.18	.....	
282,069	31,000	.23	.....	
291,000	31,980	.35	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky. Open at edges ".05 and ".20.
Elongation of rivet-holes, ".61, ".54, ".54, ".56, ".59, ".62.
Area at fracture (one section), ".75×".46=.345 square inch.
Contraction, 54.4 per cent.

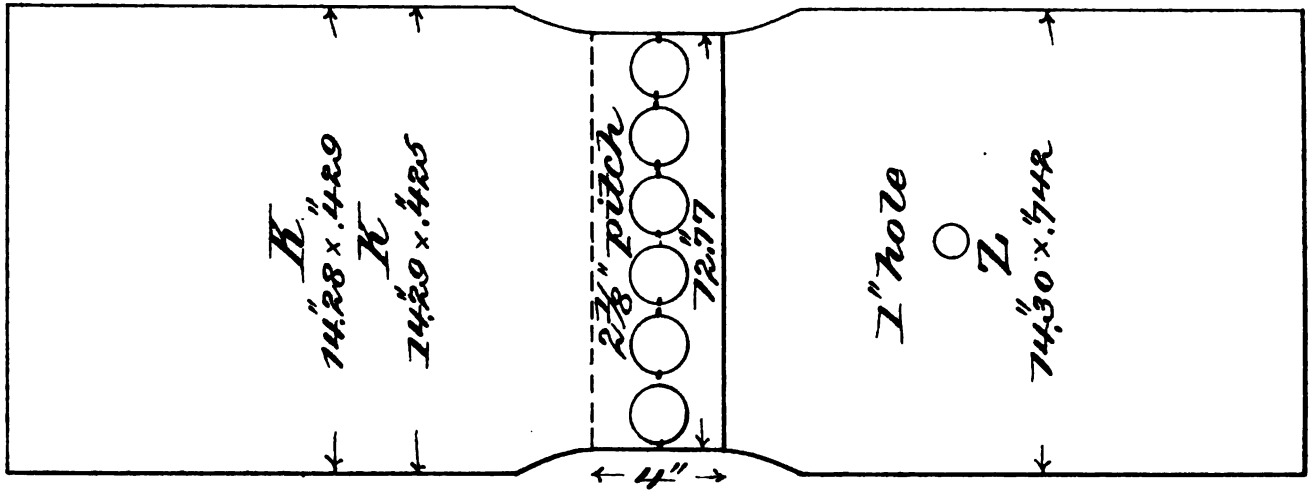
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	34,980
Tension on net section of plate	do....	68,860
Compression on bearing surface of rivets	do....	64,070
Shearing on rivets	do....	30,870

Efficiency of joint, 51.2 per cent.

No. 7484

¾" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	9.475
Plate, net sectional area	do....	5.023
Plate, bearing surface of rivets	do....	4.452
Rivets, shearing area	do....	9.425

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,475	1,000	0.	0.	Initial load.
18,950	2,000	.0001	.....	
28,425	3,000	.0003	.....	
37,900	4,000	.0015	.....	
47,375	5,000	.0039	.0029	
56,850	6,000	.0048	.....	
66,325	7,000	.0072	.....	
75,800	8,000	.0089	.....	
85,275	9,000	.0101	.....	
94,750	10,000	.0114	.0089	
104,225	11,000	.0133	.....	
113,700	12,000	.0142	.....	
123,175	13,000	.0153	.....	
132,650	14,000	.0168	.....	
142,125	15,000	.0177	.0129	
151,600	16,000	.0189	.....	
161,075	17,000	.0199	.....	
170,550	18,000	.0211	.....	
180,025	19,000	.0233	.....	
189,500	20,000	.0275	.0204	
198,975	21,000	.0349	.....	
208,450	22,000	.0426	.....	
217,925	23,000	.0504	.....	
227,400	24,000	.0614	.....	
236,875	25,000	.0748	.0644	
246,350	26,000	.0895	.....	
255,825	27,000	.1030	.....	
265,300	28,000	.12	.....	
274,775	29,000	.15	.....	
284,250	30,000	.18	.....	
293,725	31,000	.21	.....	
303,200	32,000	.26	.....	
312,675	33,000	.30	.....	
322,150	34,000	.37	.....	
326,300	34,440	.48	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky. Open at edges ″.10 each.
Elongation of rivet-holes, ″.56, ″.56, ″.56, ″.54, ″.56, ″.58.
Area at fracture (one section), ″.91×″.45=.4095 square inch.
Contraction, 50.9 per cent.

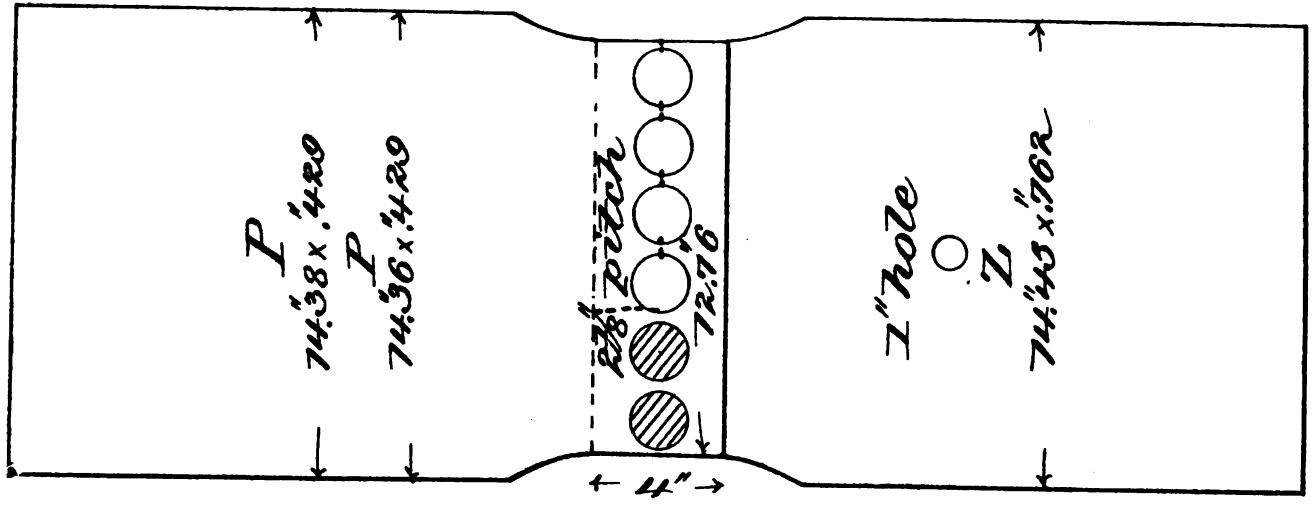
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	34,440
Tension on net section of plate	do....	64,960
Compression on bearing surface of rivets	do....	73,290
Shearing on rivets	do....	34,620

Efficiency of joint, 58.3 per cent.

No. 7485

3/4" steel plate



H Ex 31 ... 49 2

Areas.

Plate, gross sectional area	square inches	9.723
Plate, net sectional area	do	5.151
Plate, bearing surface of rivets	do	4.572
Rivets, shearing area	do	9.425

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,723	1,000	0.	0.	Initial load.
19,446	2,000	.0000	.....	
29,169	3,000	.0002	.....	
38,892	4,000	.0002	.....	
48,615	5,000	.0003	0.	
58,338	6,000	.0004	.....	
68,061	7,000	.0006	.....	
77,784	8,000	.0011	.....	
87,507	9,000	.0021	.....	
97,230	10,000	.0023	.0030	
106,953	11,000	.0048	.....	
116,676	12,000	.0058	.....	
126,399	13,000	.0066	.....	
136,122	14,000	.0076	.....	
145,845	15,000	.0084	.0073	
155,568	16,000	.0098	.....	
165,291	17,000	.0109	.....	
175,014	18,000	.0123	.....	
184,737	19,000	.0144	.....	
194,460	20,000	.0168	.0140	
204,183	21,000	.0202	.....	
213,906	22,000	.0228	.....	
223,629	23,000	.0274	.....	
233,352	24,000	.0425	.....	
243,075	25,000	.0590	.0513	
252,798	26,000	.0739	.....	
262,521	27,000	.0853	.....	
272,244	28,000	.1008	.....	
281,967	29,000	.1209	.....	
291,690	30,000	.15	.....	
301,413	31,000	.17	.....	
311,136	32,000	.21	.....	
320,859	33,000	.26	.....	
330,582	34,000	.34	.....	
337,400	34,700	.44	.....	Tensile strength.

Fractured plate across four sections.

Sheared two rivets.

Appearance, silky, except where the plate tore out to edge of lap, which was granular near the edges.

Elongation of rivet-holes (".26, ".36; sheared rivets in these holes), ".62, ".69, ".60, ".55.

Area at fracture (one section), ".89×".46=.4094 square inch.

Contraction, 52.2 per cent.

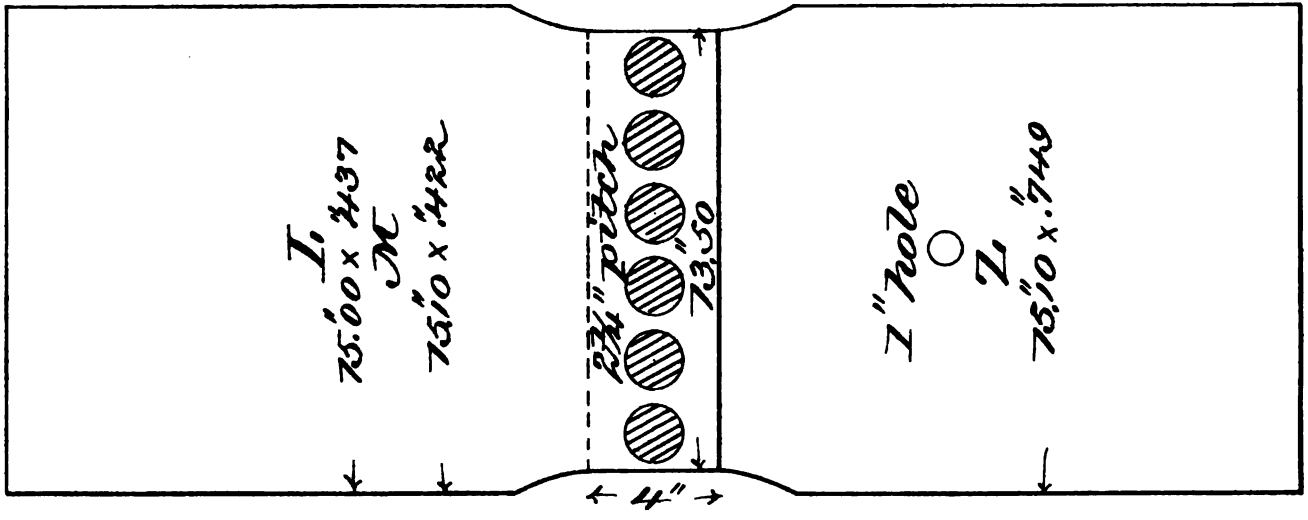
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	34,700
Tension on net section of plate	do	67,340
Compression on bearing surface of rivets	do	73,790
Shearing on rivets	do	35,800

Efficiency of joint, 58.8 per cent.

No. 7486

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	10.112
Plate, net sectional area	do....	5.618
Plate, bearing surface of rivets	do....	4.494
Rivets, shearing area	do....	9.425

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,112	1,000	0.	0.	Initial load.
20,224	2,000	.0003	.....	
30,336	3,000	.0006	.....	
40,448	4,000	.0024	.....	
50,560	5,000	.0038	.0037	
60,672	6,000	.0053	.....	
70,784	7,000	.0071	.....	
80,896	8,000	.0091	.....	
91,008	9,000	.0108	.....	
101,120	10,000	.0116	.0104	
111,232	11,000	.0133	.....	
121,344	12,000	.0141	.....	
131,456	13,000	.0150	.....	
141,568	14,000	.0158	.....	
151,680	15,000	.0167	.0138	
161,792	16,000	.0188	.....	
171,904	17,000	.0205	.....	
182,016	18,000	.0218	.....	
192,128	19,000	.0228	.....	
202,240	20,000	.0244	.0198	
212,352	21,000	.0302	.....	
222,464	22,000	.0363	.....	
232,576	23,000	.0513	.....	
242,688	24,000	.0640	.....	
252,800	25,000	.0783	.0695	
262,912	26,000	.0908	.....	
273,024	27,000	.1059	.....	
283,136	28,000	.1240	.....	
293,248	29,000	.15	.....	
303,360	30,000	.17	.....	
313,472	31,000	.20	.....	
323,584	32,000	.24	.....	
333,696	33,000	.27	.....	
343,808	34,000	.35	.....	
353,920	35,000	.44	.....	Tensile strength.

Sheared the rivets.
Elongation of rivet-holes, ".28 each.

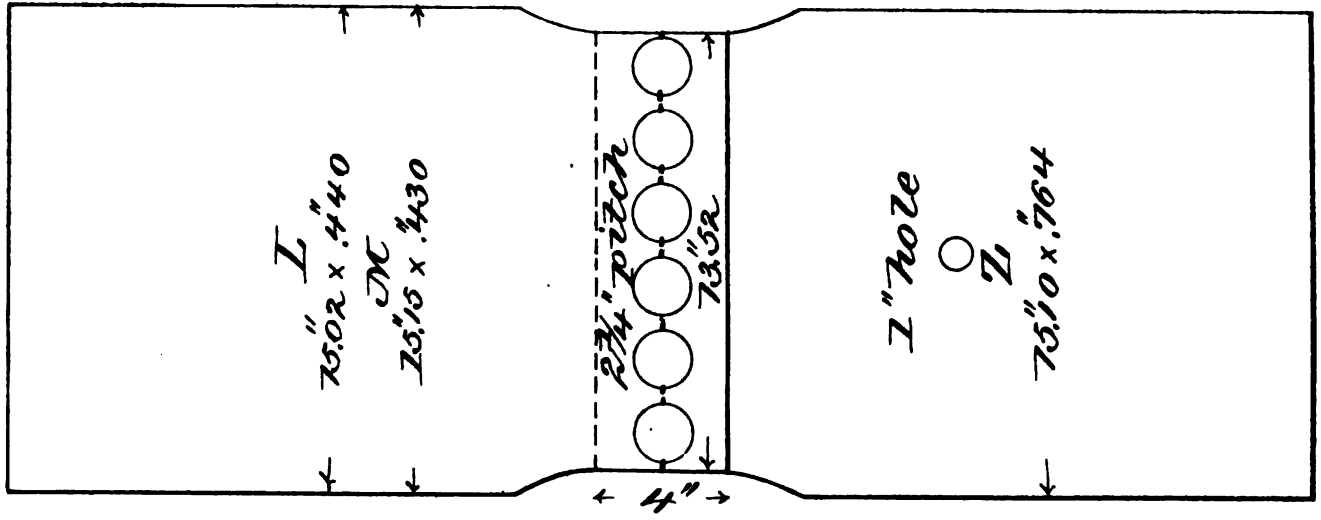
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	35,000
Tension on net section of plate	do....	63,000
Compression on bearing surface of rivets	do....	78,750
Shearing on rivets	do....	37,550

Efficiency of joint, 59.3 per cent.

No. 7487

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	10.329
Plate, net sectional area	do	5.745
Plate, bearing surface of rivets	do	4.584
Rivets, shearing area	do	9.425

[Steel rivets.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds. 379,900	*Pounds.* 36,780	*Inch.* .37	*Inch.*	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky.
Area at fracture (one section), $1''.01 \times ''.47 = .4747$ square inch.
Contraction, 50.3 per cent.
Elongation of rivet-holes, ".46, ".48, ".53, ".56, ".56, ".45.

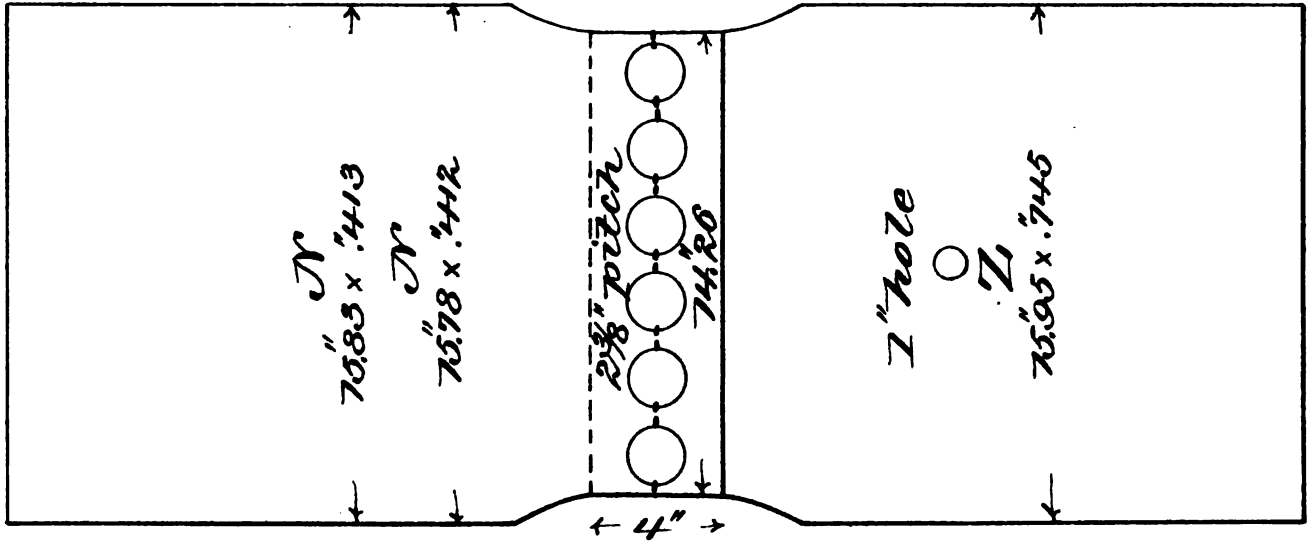
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	36,780
Tension on net section of plate	do	66,130
Compression on bearing surface of rivets	do	82,870
Shearing on rivets	do	40,310

Efficiency of joint, 62.3 per cent.

No. 7488

¾" Steel plate



H Ex 31 49 2

29.99500
30.01425
+ .01920

Comp. = $\frac{14\,000\,000}{1\,580}$ × 1920 = 9000

28.00468
28.00170
— .00298

Tens. = 1490.

26.00538
26.00128
— .00410

Tens = 2128

24.00583
24.00243
— .00340

Tens. = 1980

22.00593
22.00288
— .00305

Tens. = 1940

20.00283
20.00035
— .00248

Tens = 1740

18.01570
18.01365
— .00145

Tens = 1130

16.01278
16.01175
— .00103

Tens = 905

14.01215
14.01268
+ .00053

Comp. = 530

12.01298
12.01438
+ .00140

Comp = 1680

10.02475
10.02830
+ .00355

Comp = 4900

~~30.01425 29.46555 28.00170 2~~

re inches.. 10.624
....do.... 6.154
....do.... 4.470
....do.... 9.425

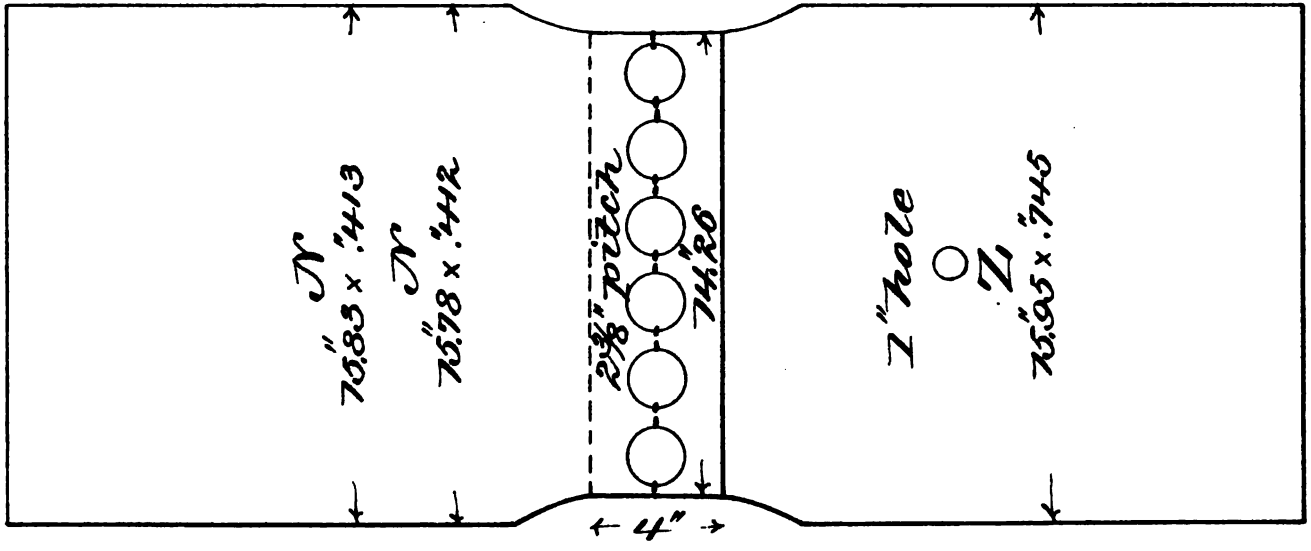
.8. 1453

0.
inch.

re inch... 38.120
....do.... 66.810
....do.... 90.600
....do.... 42.970

No. 7488

¾" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	10.624
Plate, net sectional area	do....	6.154
Plate, bearing surface of rivets	do....	4.470
Rivets, shearing area	do....	9.425

[Steel rivets.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,624	1,000	0.	0.	Initial load.
21,248	2,000	.0000	.....	
31,872	3,000	.0005	.....	
42,496	4,000	.0008	.....	
53,120	5,000	.0008	.0005	
63,744	6,000	.0011	.....	
74,368	7,000	.0021	.....	
84,992	8,000	.0056	.....	
95,616	9,000	.0066	.....	
106,240	10,000	.0078	.0063	
116,864	11,000	.0081	.....	
127,488	12,000	.0088	.....	
138,112	13,000	.0098	.....	
148,736	14,000	.0104	.....	
159,360	15,000	.0111	.0087	
169,984	16,000	.0126	.....	
180,608	17,000	.0139	.....	
191,232	18,000	.0149	.....	
201,856	19,000	.0161	.....	
212,480	20,000	.0172	.0126	
223,104	21,000	.0188	.....	
233,728	22,000	.0206	.....	
244,352	23,000	.0221	.....	
254,976	24,000	.0246	.....	
265,600	25,000	.0316	.0246	
276,224	26,000	.0406	.....	
286,848	27,000	.0481	.....	
297,472	28,000	.0571	.....	
308,096	29,000	.0661	.....	
318,720	30,000	.0781	.0681	
329,344	31,000	.0960	.....	
339,968	32,000	.11	.....	
350,592	33,000	.13	.....	
361,216	34,000	.15	.....	
371,840	35,000	.17	.....	
382,464	36,000	.20	.....	
393,088	37,000	.26	.....	
403,712	38,000	.35	.....	
405,000	38,120	.....	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, lamellar. Open at edges ″.15 and ″.20.
Area at fracture (one section), 1″.14×″.49=.5586 square inch.
Contraction, 45.4 per cent.
Elongation of rivet-holes, ″.56, ″.56, ″.58, ″.62, ″.68, ″.76.

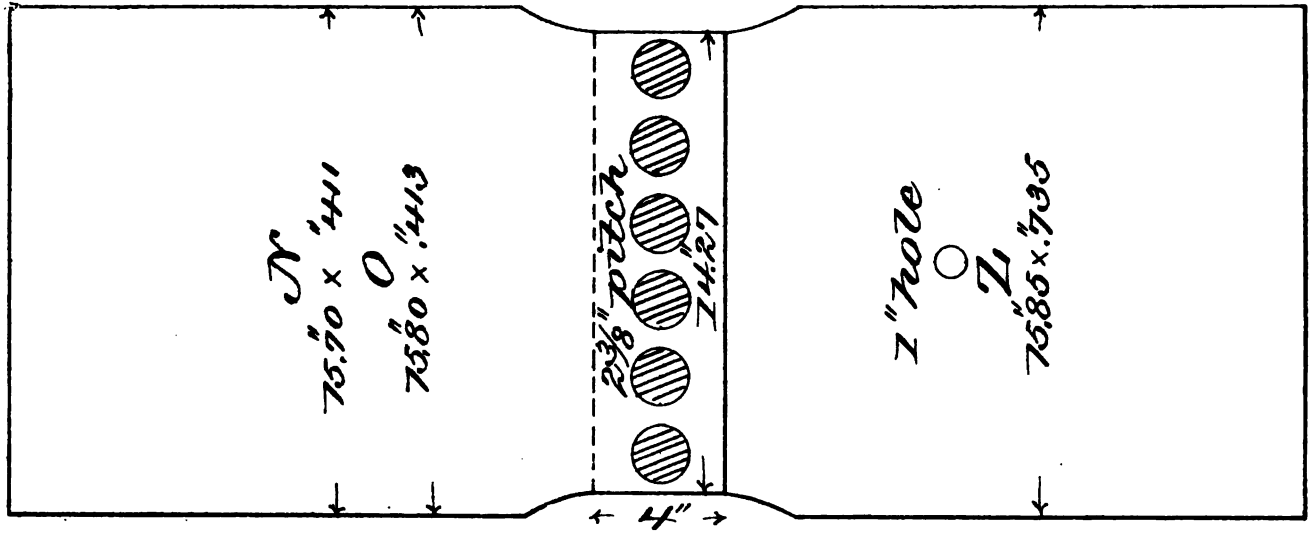
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	38,120
Tension on net section of plate	do....	65,810
Compression on bearing surface of rivets	do....	90,000
Shearing on rivets	do....	42,970

Efficiency of joint, 64.6 per cent.

No. 7489

¾" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	10.488
Plate, net sectional area	do....	6.078
Plate, bearing surface of rivets	do....	4.410
Rivets, shearing area	do....	9.425

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,488	1,000	0.	0.	Initial load.
20,976	2,000	.0001	.....	
31,464	3,000	.0004	.....	
41,952	4,000	.0005	.....	
52,440	5,000	.0006	.0002	
62,928	6,000	.0010	.....	
73,416	7,000	.0057	.....	
83,904	8,000	.0067	.....	
94,392	9,000	.0074	.....	
104,880	10,000	.0081	.0071	
115,368	11,000	.0089	.....	
125,856	12,000	.0094	.....	
136,344	13,000	.0103	.....	
146,832	14,000	.0117	.....	
157,320	15,000	.0143	.0120	
167,808	16,000	.0157	.....	
178,296	17,000	.0169	.....	
188,784	18,000	.0177	.....	
199,272	19,000	.0187	.....	
209,760	20,000	.0198	.0158	
220,248	21,000	.0235	.....	
230,736	22,000	.0287	.....	
241,224	23,000	.0415	.....	
251,712	24,000	.0527	.....	
262,200	25,000	.0652	.0561	
272,688	26,000	.0782	.....	
283,176	27,000	.0912	.....	
293,664	28,000	.1060	.....	
304,152	29,000	.13	.....	
314,640	30,000	.16	.....	
325,128	31,000	.18	.....	
335,616	32,000	.21	.....	
346,104	33,000	.26	.....	
356,592	34,000	.31	.....	Tensile strength.

Sheared the rivets.
Elongation of rivet-holes, ".14 each.

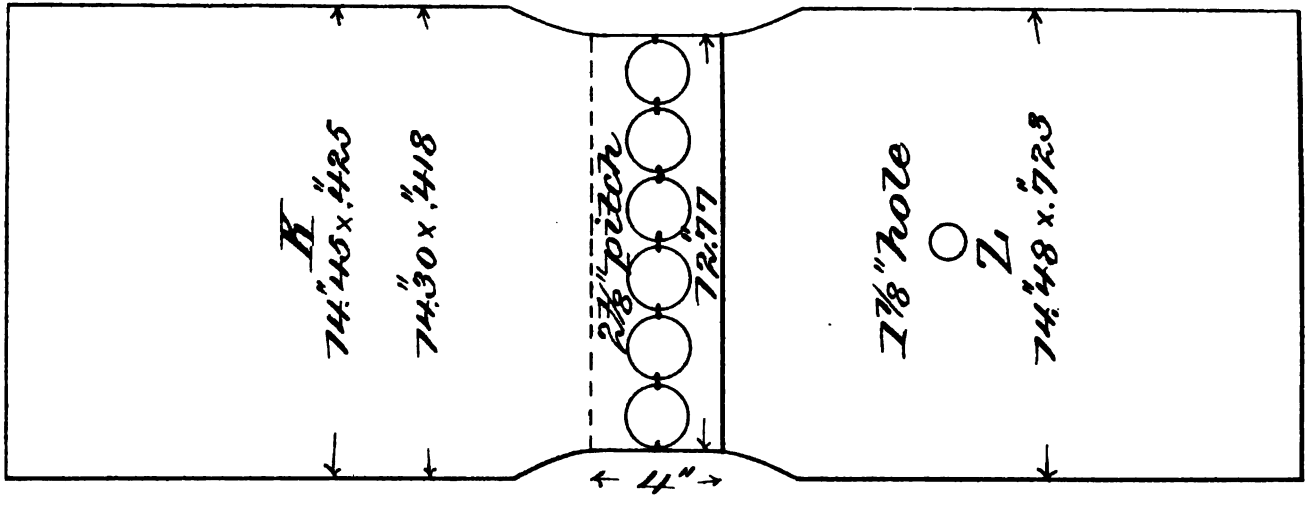
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	34,000
Tension on net section of plate	do....	58,670
Compression on bearing surface of rivets	do....	80,860
Shearing on rivets	do....	37,830

Efficiency of joint, 57.6 per cent.

No. 7490

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	9.233
Plate, net sectional area	do....	4.353
Plate, bearing surface of rivets	do....	4.880
Rivets, shearing area	do....	11.928

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,233	1,000	0.	0.	Initial load.
18,466	2,000	.0001	.....	
27,699	3,000	.0003	.....	
36,932	4,000	.0006	.....	
46,165	5,000	.0018	.0014	
55,398	6,000	.0024	.....	
64,631	7,000	.0030	.....	
73,864	8,000	.0041	.....	
83,097	9,000	.0052	.....	
92,330	10,000	.0061	.0055	
101,563	11,000	.0074	.....	
110,796	12,000	.0084	.....	
120,029	13,000	.0097	.....	
129,262	14,000	.0111	.....	
138,495	15,000	.0134	.0104	
147,728	16,000	.0154	.....	
156,961	17,000	.0187	.....	
166,194	18,000	.0211	.....	
175,427	19,000	.0255	.....	
184,660	20,000	.0298	.0246	
193,893	21,000	.0344	.....	
203,126	22,000	.0403	.....	
212,359	23,000	.0494	.....	
221,592	24,000	.0590	.....	
230,825	25,000	.0720	.0641	
240,058	26,000	.0860	.....	
249,291	27,000	.1051	.....	
258,524	28,000	.12	.....	
267,757	29,000	.16	.....	
276,990	30,000	.19	.....	
286,223	31,000	.29	.....	
286,700	31,050	.34	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, very lamellar. Open at edges ″.15 and ″.10.
Elongation of rivet-holes, ″.46, ″.48, ″.48, ″.50, ″.52, ″.48.
Area at fracture (one section), ″.81×″.48=.3888 square inch.
Contraction, 46.2 per cent.

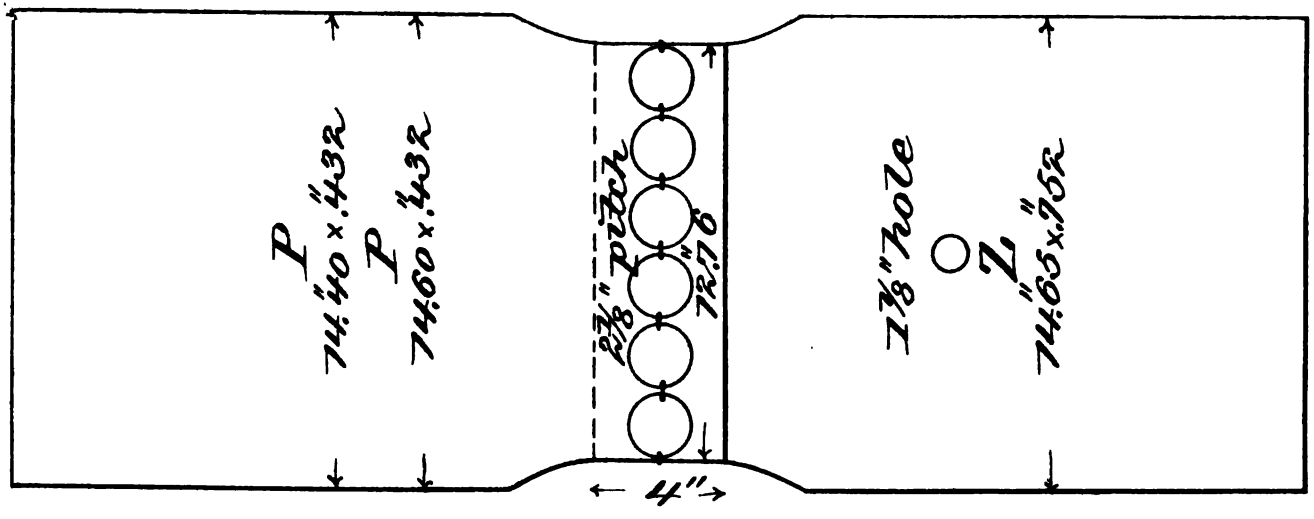
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	31,050
Tension on net section of plate	do....	65,860
Compression on bearing surface of rivets	do....	58,750
Shearing on rivets	do....	24,030

Efficiency of joint, 52.6 per cent.

No. 7497

3/4" steel plate



H Ex 31 492

Areas.

Plate, gross sectional area	square inches..	9.596
Plate, net sectional area	do....	4.520
Plate, bearing surface of rivets	do....	5.076
Rivets, shearing area	do....	11.928

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,596	1,000	0.	0.	Initial load.
19,192	2,000	.0005	.....	
28,788	3,000	.0005	.....	
38,384	4,000	.0007	.....	
47,980	5,000	.0010	.0004	
57,576	6,000	.0013	.....	
67,172	7,000	.0018	.....	
76,768	8,000	.0027	.....	
86,364	9,000	.0058	.....	
95,960	10,000	.0067	.0051	
105,556	11,000	.0075	.....	
115,152	12,000	.0080	.....	
124,748	13,000	.0090	.....	
134,344	14,000	.0102	.....	
143,940	15,000	.0115	.0087	
153,536	16,000	.0134	.....	
163,132	17,000	.0149	.....	
172,728	18,000	.0175	.....	
182,324	19,000	.0197	.....	
191,920	20,000	.0226	.0183	
201,516	21,000	.0276	.....	
211,112	22,000	.0321	.....	
220,708	23,000	.0376	.....	
230,304	24,000	.0468	.....	
239,900	25,000	.0559	.0475	
249,496	26,000	.0690	.....	
259,092	27,000	.0843	.....	
268,688	28,000	.1080	.....	
278,284	29,000	.14	.....	
287,880	30,000	.17	.....	
297,476	31,000	.21	.....	
307,072	32,000	.29	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky. Open at edges ″.15 and ″.05.
Elongation of rivet-holes, ″.50, ″.50, ″.48, ″.48, ″.45, ″.41.
Area at fracture (one section), ″.84×″.51=.4282 square inch.
Contraction, 43.0 per cent.

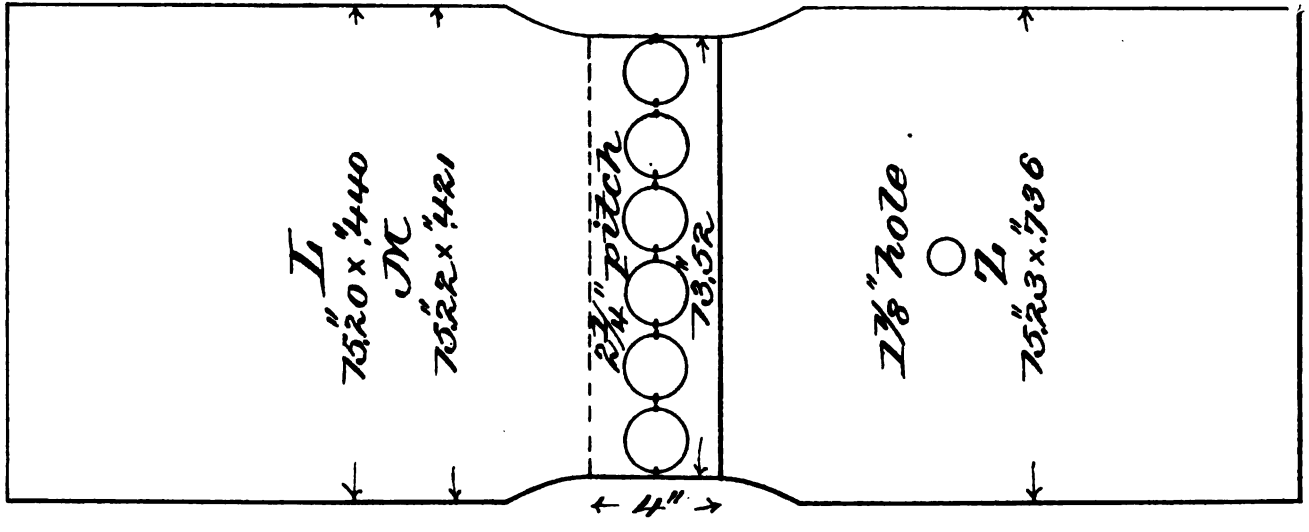
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	32,000
Tension on net section of plate	do....	67,940
Compression on bearing surface of rivets	do....	65,340
Shearing on rivets	do....	25,740

Efficiency of joint, 54.2 per cent.

No. 7492

3/4" steel plate



H Ex 31 492

Areas.

Plate, gross sectional area	square inches..	9.951
Plate, net sectional area	do....	4.983
Plate, bearing surface of rivets	do....	4.968
Rivets, shearing area	do....	11.928

Applied loads.		In ganged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,951	1,000	0.	0.	Initial load.
19,902	2,000	.0000	.....	
29,853	3,000	.0001	.....	
39,804	4,000	.0002	.....	
49,755	5,000	.0006	.0003	
59,706	6,000	.0015	.....	
69,657	7,000	.0021	.....	
79,608	8,000	.0027	.....	
89,559	9,000	.0035	.....	
99,510	10,000	.0047	.0038	
109,461	11,000	.0058	.....	
119,412	12,000	.0067	.....	
129,363	13,000	.0076	.....	
139,314	14,000	.0085	.....	
149,265	15,000	.0097	.0078	
159,216	16,000	.0113	.....	
169,167	17,000	.0123	.....	
179,118	18,000	.0132	.....	
189,069	19,000	.0147	.....	
199,020	20,000	.0176	.0134	
208,971	21,000	.0220	.....	
218,922	22,000	.0243	.....	
228,873	23,000	.0292	.....	
238,824	24,000	.0361	.....	
248,775	25,000	.0510	.0430	
258,726	26,000	.0640	.....	
268,677	27,000	.0790	.....	
278,628	28,000	.0971	.....	
288,579	29,000	.1149	.....	
298,530	30,000	.14	.....	
308,481	31,000	.16	.....	
318,432	32,000	.19	.....	
328,383	33,000	.25	.....	
338,334	34,000	.30	.....	
341,000	34,270	.37	.....	Tensile strength.

Fractured plate along line of riveting.

Appearance, silky, lamellar, seam across one section. Open at edges ″.05 and 0″.

Area at fracture (one section), ″.93×″.48=.4464 square inch.

Contraction, 46.0 per cent.

Elongation of rivet-holes, ″.49, ″.49, ″.49, ″.48, ″.50, ″.50.

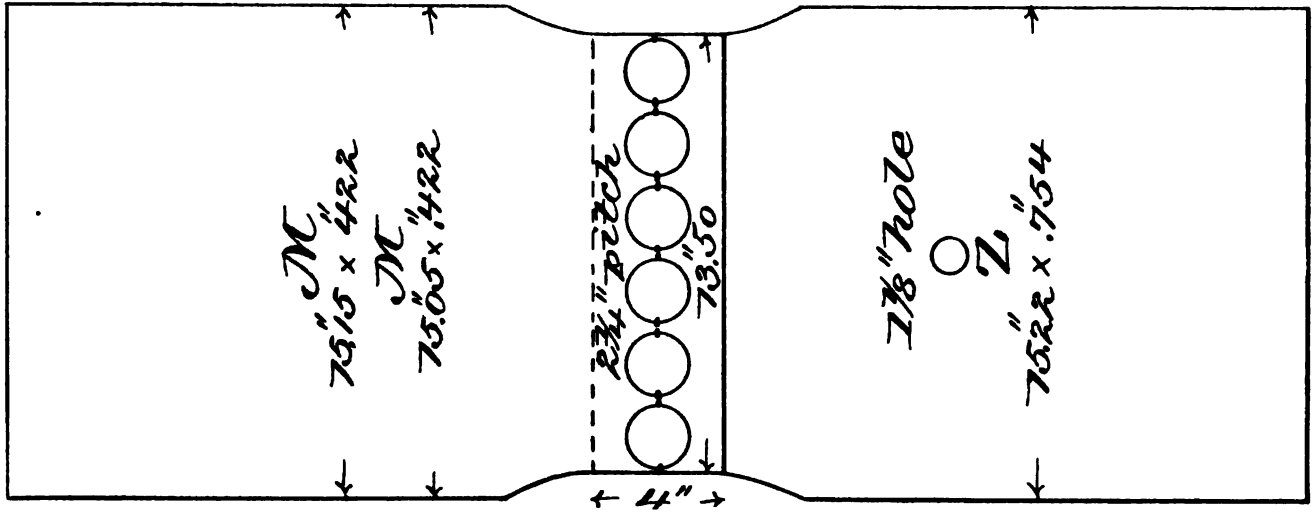
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	34,270
Tension on net section of plate	do....	68,430
Compression on bearing surface of rivets	do....	68,640
Shearing on rivets	do....	28,590

Efficiency of joint, 58.0 per cent.

No. 7493

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	10.179
Plate, net sectional area	do....	5.089
Plate, bearing surface of rivets	do....	5.090
Rivets, shearing area	do....	11.928

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,179	1,000	0.	0.	Initial load.
20,358	2,000	.0001	.....	
30,537	3,000	.0003	.....	
40,716	4,000	.0006	.....	
50,895	5,000	.0006	−.0001	
61,074	6,000	.0012	.....	
71,253	7,000	.0016	.....	
81,432	8,000	.0027	.....	
91,611	9,000	.0049	.....	
101,790	10,000	.0064	.0048	
111,969	11,000	.0083	.....	
122,148	12,000	.0092	.....	
132,327	13,000	.0100	.....	
142,506	14,000	.0114	.....	
152,685	15,000	.0129	.0190	
162,864	16,000	.0139	.....	
173,043	17,000	.0153	.....	
183,222	18,000	.0168	.....	
193,401	19,000	.0188	.....	
203,580	20,000	.0218	.0156	
213,759	21,000	.0254	.....	
223,938	22,000	.0318	.....	
234,117	23,000	.0379	.....	
244,296	24,000	.0445	.....	
254,475	25,000	.0537	.0445	
264,654	26,000	.0603	.....	
274,833	27,000	.0790	.....	
285,012	28,000	.0900	.....	
295,191	29,000	.1140	.....	
305,370	30,000	.14	.....	
315,549	31,000	.16	.....	
325,728	32,000	.19	.....	
335,907	33,000	.25	.....	
343,700	33,770	.33	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, lamellar. Open at edges ".15.
Elongation of rivet-holes, ".52, ".48, ".47, ".47, ".49, ".53.
Area at fracture (one section), ".95×".52=.4940 square inch.
Contraction, 41.7 per cent.

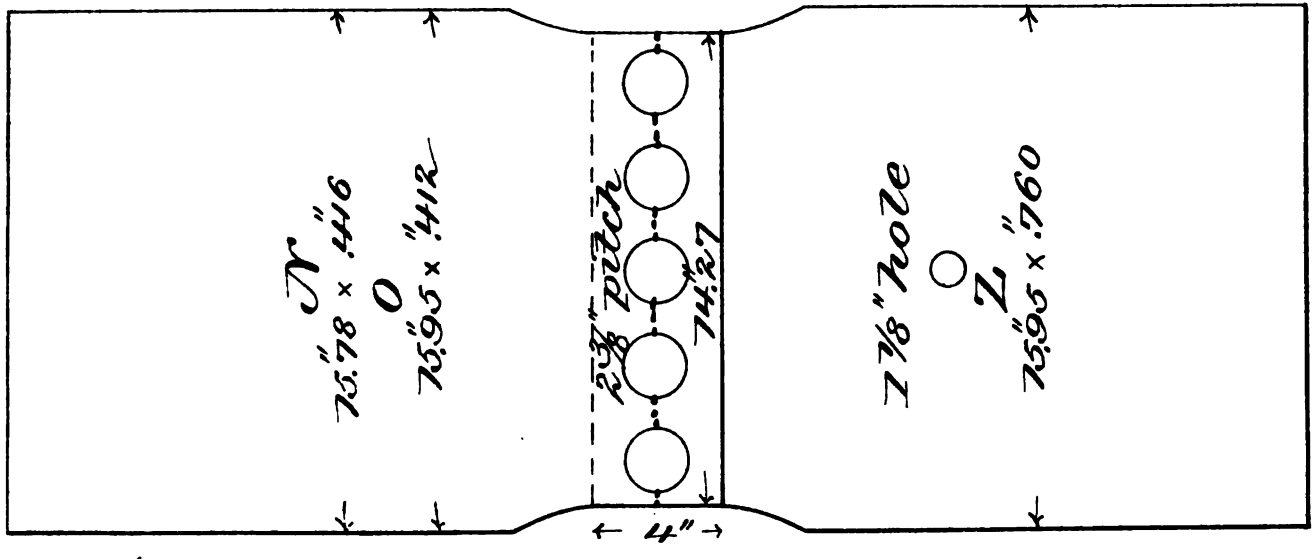
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	33,770
Tension on net section of plate	do....	67,540
Compression on bearing surface of rivets	do....	67,520
Shearing on rivets	do....	28,810

Efficiency of joint, 57.2 per cent.

No. 7494

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	10.845
Plate, net sectional area	do	5.715
Plate, bearing surface of rivets	do	5.130
Rivets, shearing area	do	11.928

Applied loads.		In ganged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,845	1,000	0.	0.	Initial load.
21,690	2,000	.0000	.....	
32,535	3,000	.0002	.....	
43,380	4,000	.0005	.....	
54,225	5,000	.0010	.0005	
65,070	6,000	.0014	.....	
75,915	7,000	.0029	.....	
86,760	8,000	.0047	.....	
97,605	9,000	.0068	.....	
108,450	10,000	.0084	.0065	
119,295	11,000	.0100	.....	
130,140	12,000	.0110	.....	
140,985	13,000	.0120	.....	
151,830	14,000	.0132	.....	
162,675	15,000	.0149	.0110	
173,520	16,000	.0165	.....	
184,365	17,000	.0185	.....	
195,210	18,000	.0202	.....	
206,055	19,000	.0231	.....	
216,900	20,000	.0267	.0197	
227,745	21,000	.0330	.....	
238,590	22,000	.0414	.....	
249,435	23,000	.0492	.....	
260,280	24,000	.0602	.....	
271,125	25,000	.0717	.0617	
281,970	26,000	.0888	.....	
292,815	27,000	.1038	.....	
303,660	28,000	.1200	.....	
314,505	29,000	.15	.....	
325,350	30,000	.18	.....	
336,195	31,000	.21	.....	
347,040	32,000	.25	.....	
357,885	33,000	.29	.....	
368,730	34,000	.36	.....	
378,500	34,900	.47	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky. Open at edges ″.15 and ″.20.
Elongation of rivet-holes, ″.58, ″.56, ″.56, ″.56, ″.59, ″.64.
Area at fracture (one section), 1″.04 × ″.50 = .52 square inch.
Contraction, 45.2 per cent.

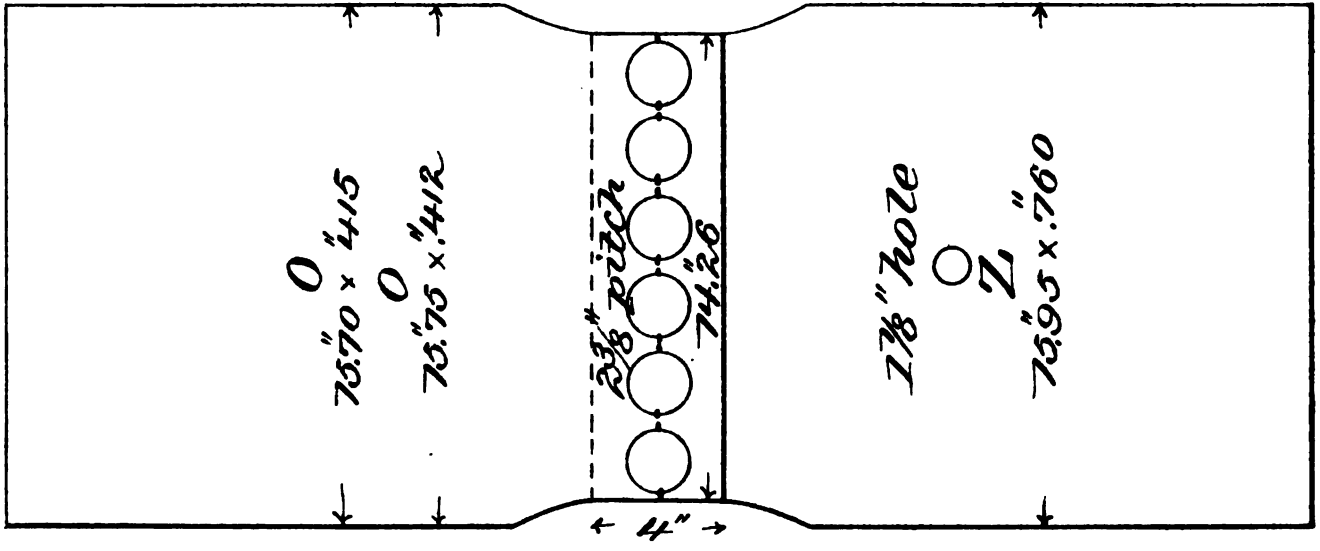
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	34,900
Tension on net section of plate	do	66,230
Compression on bearing surface of rivets	do	73,780
Shearing on rivets	do	31,730

Efficiency of joint, 59.1 per cent.

No. 7495

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	10.838
Plate, net sectional area	do....	5.708
Plate, bearing surface of rivets	do....	5.130
Rivets, shearing area	do....	11.928

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,838	1,000	0.	0.	Initial load.
21,676	2,000	.0005	.....	
32,514	3,000	.0005	.....	
43,352	4,000	.0010	.....	
54,190	5,000	.0025	.0021	
65,028	6,000	.0041	.....	
75,866	7,000	.0056	.....	
86,704	8,000	.0075	.....	
97,542	9,000	.0094	.....	
108,380	10,000	.0104	.0090	
119,218	11,000	.0112	.....	
130,056	12,000	.0125	.....	
140,894	13,000	.0140	.....	
151,732	14,000	.0150	.....	
162,570	15,000	.0164	.0135	
173,408	16,000	.0185	.....	
184,246	17,000	.0194	.....	
195,084	18,000	.0205	.....	
205,922	19,000	.0220	.....	
216,760	20,000	.0233	.0175	
227,598	21,000	.0269	.....	
238,436	22,000	.0310	.....	
249,274	23,000	.0440	.....	
260,112	24,000	.0565	.....	
270,950	25,000	.0735	.0635	
281,788	26,000	.0875	.....	
292,626	27,000	.1033	.....	
303,464	28,000	.12	.....	
314,302	29,000	.15	.....	
325,140	30,000	.17	.....	
335,978	31,000	.20	.....	
346,816	32,000	.24	.....	
357,654	33,000	.28	.....	
368,492	34,000	.35	.....	
379,330	35,000	.41	.....	
388,100	35,810	.54	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slight lamination. Open at one edge ".10.
Elongation of rivet-holes, ".59 each.
Area at fracture (one section), 1".02 × ".47 = .4794 square inch.
Contraction, 49.5 per cent.

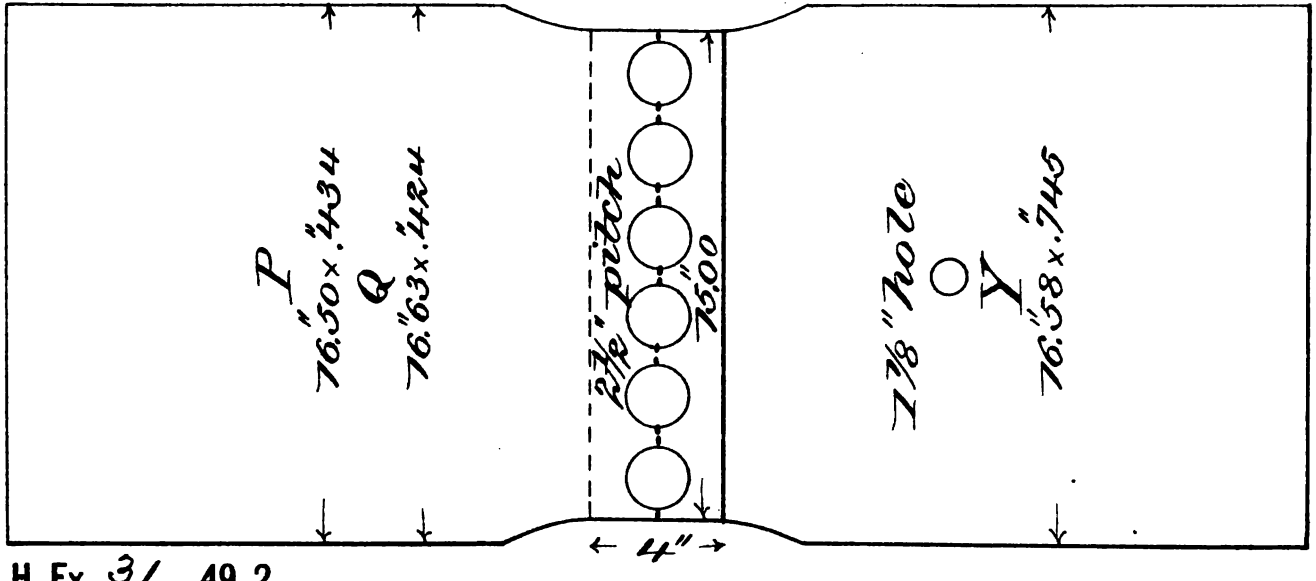
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	35,810
Tension on net section of plate	do....	67,990
Compression on bearing surface of rivets	do....	75,650
Shearing on rivets	do....	32,540

Efficiency of joint, 60.6 per cent.

No. 7496

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	11.175
Plate, net sectional area	do	6.146
Plate, bearing surface of rivets	do	5.029
Rivets, shearing area	do	11.928

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds	*Pounds.*	*Inch.*	*Inch.*	
11,175	1,000	0.	0.	Initial load.
22,350	2,000	.0001		
33,525	3,000	.0002		
44,700	4,000	.0003		
55,875	5,000	.0008	.0003	
67,050	6,000	.0010		
78,225	7,000	.0022		
89,400	8,000	.0036		
100,575	9,000	.0051		
111,750	10,000	.0065	.0054	
122,925	11,000	.0074		
134,100	12,000	.0078		
145,275	13,000	.0090		
156,450	14,000	.0106		
167,625	15,000	.0121	.0099	
178,800	16,000	.0138		
189,975	17,000	.0152		
201,150	18,000	.0164		
212,325	19,000	.0179		
223,500	20,000	.0192	.0155	
234,675	21,000	.0219		
245,750	22,000	.0245		
256,925	23,000	.0299		
268,100	24,000	.0433		
279,375	25,000	.0570	.0480	
290,550	26,000	.0668		
301,725	27,000	.0785		
312,900	28,000	.0922		
324,075	29,000	.1065		
335,250	30,000	.14		
346,425	31,000	.16		
357,600	32,000	.18		
368,775	33,000	.22		
379,950	34,000	.26		
391,125	35,000	.28		
402,300	36,000	.35		
413,475	37,000	.38		
424,650	38,000	.47		
429,900	38,470	.54		Tensile strength.

Fractured plate along line of riveting.

Appearance, silky, slightly lamellar; 10 per cent. of one fractured section granular, and traces of granular metal in one other section. Open at edges ".25 and ".15.

Elongation of rivet-holes, ".66, ".61, ".57, ".57, ".60, ".66.

Area at fracture (one section), 1".22×".51=.6222 square inch.

Contraction, 39.2 per cent.

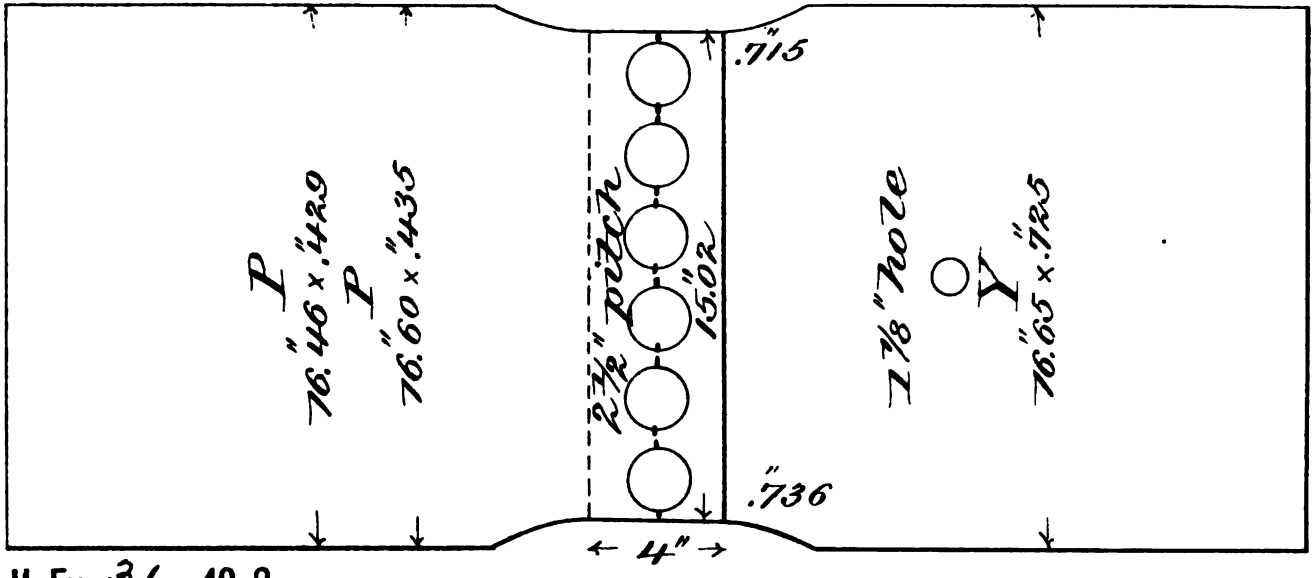
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	38,470
Tension on net section of plate	do	69,940
Compression on bearing surface of rivets	do	85,480
Shearing on rivets	do	36,040

Efficiency of joint, 63.6 per cent.

No. 7497

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	10.890
Plate, net sectional area	do	5.996
Plate, bearing surface of rivets	do	4.894
Rivets, shearing area	do	11.928

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,890	1,000	0.	0.	Initial load.
21,780	2,000	.0003	.....	
32,670	3,000	.0005	.....	
43,560	4,000	.0007	.....	
54,450	5,000	.0010	.0007	
65,340	6,000	.0018	.....	
76,230	7,000	.0037	.....	
87,120	8,000	.0048	.....	
98,010	9,000	.0065	.....	
108,900	10,000	.0075	.0062	
119,790	11,000	.0089	.....	
130,680	12,000	.0100	.....	
141,570	13,000	.0118	.....	
152,460	14,000	.0126	.....	
163,350	15,000	.0136	.0114	
174,240	16,000	.0153	.....	
185,130	17,000	.0167	.....	
196,020	18,000	.0180	.....	
206,910	19,000	.0190	.....	
217,800	20,000	.0209	.0160	
228,690	21,000	.0236	.....	
239,580	22,000	.0263	.....	
250,470	23,000	.0317	.....	
261,360	24,000	.0425	.....	
272,250	25,000	.0555	.0475	
283,140	26,000	.0681	.....	
294,030	27,000	.0780	.....	
304,920	28,000	.0920	.....	
315,810	29,000	.1003	.....	
326,700	30,000	.1200	.....	
337,590	31,000	.15	.....	
348,480	32,000	.18	.....	
359,370	33,000	.20	.....	
370,260	34,000	.24	.....	
381,150	35,000	.28	.....	
392,040	36,000	.32	.....	
402,930	37,000	.38	.....	
411,000	37,740	.....	.....	Tensile strength.

Fractured plate along line of riveting.

Appearance, silky. One end section granular, radiating from a spot of silky metal next rivet-hole. This section fractured first with a sharp report. Open at edges ".30 each.

Area at fracture (one section), 1".18×".50=.59 square inch.

Contraction, 40.8 per cent.

Elongation of rivet-holes, ".69, ".64, ".58, ".55, "57, ".63.

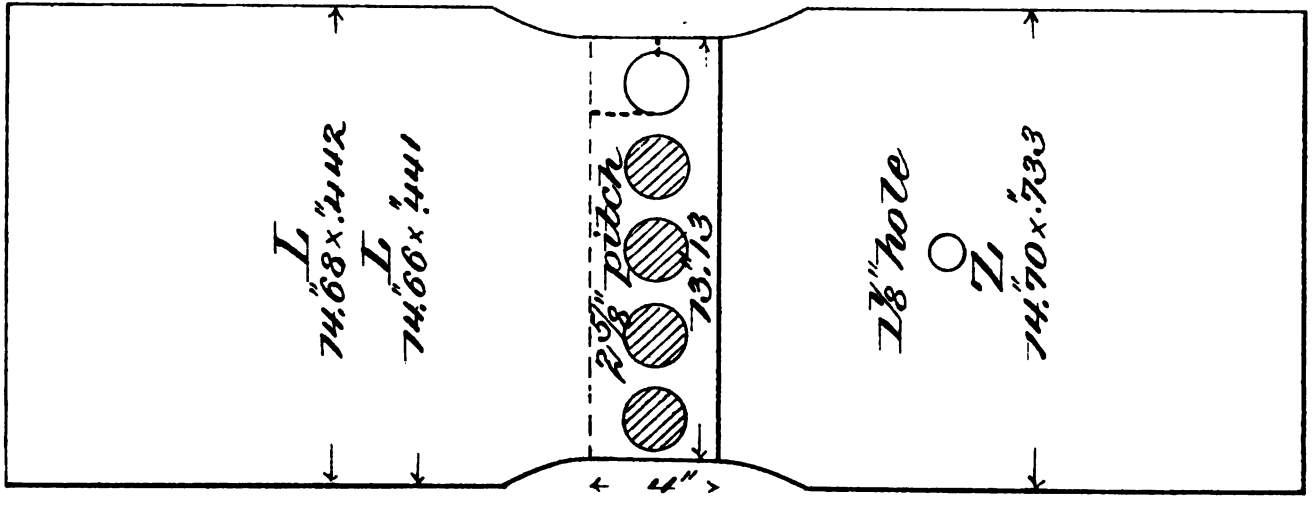
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	37,740
Tension on net section of plate	do	68,650
Compression on bearing surface of rivets	do	83,980
Shearing on rivets	do	34,460

Efficiency of joint, 62.4 per cent.

No. 1498

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	9.624
Plate, net sectional area	do....	5.501
Plate, bearing surface of rivets	do...	4.123
Rivets, shearing area	do....	9.940

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,624	1,000	0.	0.	Initial load.
19,248	2,000	.0004	.....	
28,872	3,000	.0009	.....	
38,496	4,000	.0028	.....	
48,120	5,000	.0045	.0038	
57,744	6,000	.0061	.....	
67,368	7,000	.0087	.....	
76,992	8,000	.0102	.....	
86,616	9,000	.0122	.....	
96,240	10,000	.0140	.0112	
105,864	11,000	.0154	.....	
115,488	12,000	.0168	.....	
125,112	13,000	.0178	.....	
134,736	14,000	.0189	.....	
144,360	15,000	.0207	.0149	
153,984	16,000	.0249	.....	
163,608	17,000	.0280	.....	
173,232	18,000	.0309	.....	
182,856	19,000	.0323	.....	
192,480	20,000	.0349	.0260	
202,104	21,000	.0391	.....	
211,728	22,000	.0444	.....	
221,352	23,000	.0514	.....	
230,976	24,000	.0632	.....	
240,600	25,000	.0773	.0661	
250,224	26,000	.0900	.....	
259,848	27,000	.1060	.....	
269,472	28,000	.12	.....	
279,096	29,000	.15	.....	
288,720	30,000	.17	.....	
298,344	31,000	.20	.....	
307,968	32,000	.22	.....	
317,592	33,000	.27	.....	
327,216	34,000	.31	.....	
336,840	35,000	.37	.....	Tensile strength.

Sheared four rivets and fractured plate at one end section.
Appearance of fracture, silky.
Elongation of rivet-holes, ".20, ".26, ".31, ".40.

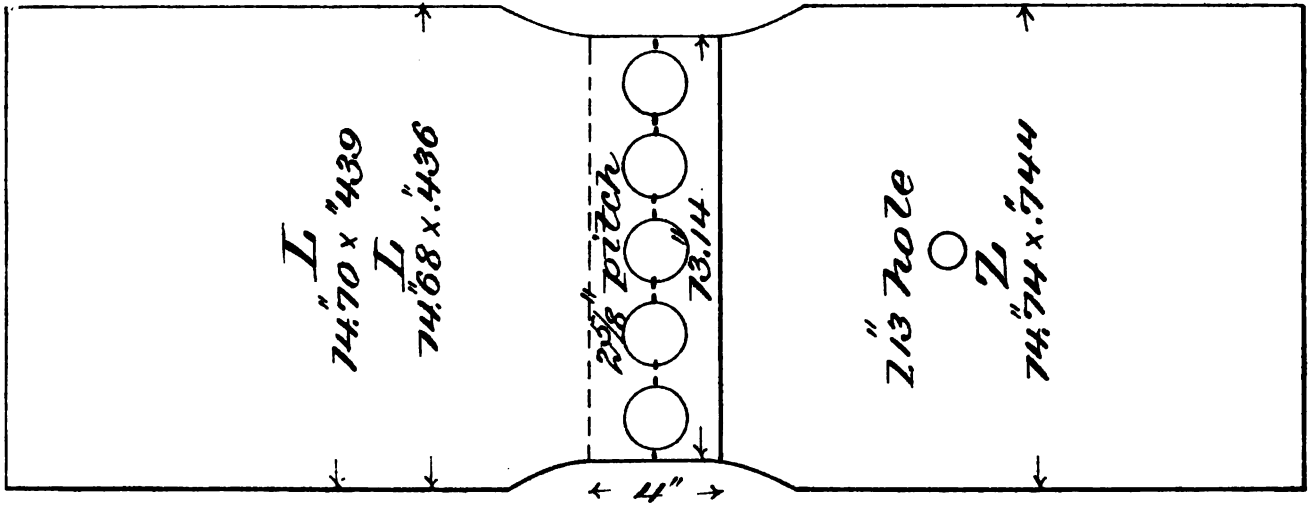
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	35,000
Tension on net section of plate	do....	61,230
Compression on bearing surface of rivets	do....	81,700
Shearing on rivets	do....	33,890

Efficiency of joint, 57.0 per cent.

No. 1499

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	9.776
Plate, net sectional area	do....	5.572
Plate, bearing surface of rivets	do....	4.204
Rivets, shearing area	do....	10.030

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,776	1,000	0.	0.	Initial load.
19,552	2,000	.0001	.....	
29,328	3,000	.0002	.....	
39,104	4,000	.0003	.....	
48,880	5,000	.0004	.0003	
58,656	6,000	.0010	.....	
68,432	7,000	.0021	.....	
78,208	8,000	.0031	.....	
87,984	9,000	.0036	.....	
97,760	10,000	.0052	.0043	
107,536	11,000	.0062	.....	
117,312	12,000	.0079	.....	
127,088	13,000	.0090	.....	
136,864	14,000	.0103	.....	
146,640	15,000	.0113	.0104	
156,416	16,000	.0121	.....	
166,192	17,000	.0128	.....	
175,968	18,000	.0138	.....	
185,744	19,000	.0177	.....	
195,520	20,000	.0194	.0176	
205,296	21,000	.0263	.....	
215,072	22,000	.0327	.....	
224,848	23,000	.0465	.....	
234,624	24,000	.0588	.....	
244,400	25,000	.0728	.....	
254,176	26,000	.0917	.....	
263,952	27,000	.1021	.....	
273,728	28,000	.13	.....	
283,504	29,000	.15	.....	
293,280	30,000	.18	.....	
303,056	31,000	.21	.....	
312,832	32,000	.24	.....	
322,608	33,000	.30	.....	
332,384	34,000	.35	.....	
342,160	35,000	.40	.....	
351,936	36,000	51	.....	
356,550	36,470	.61	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky. Open at edges ".15 and ".10.
Elongation of rivet-holes, ".70, ".70, ".70, ".70, ".72.
Area at fracture (one section), 1".24×".46=.5704 square inch.
Contraction, 48.8 per cent.

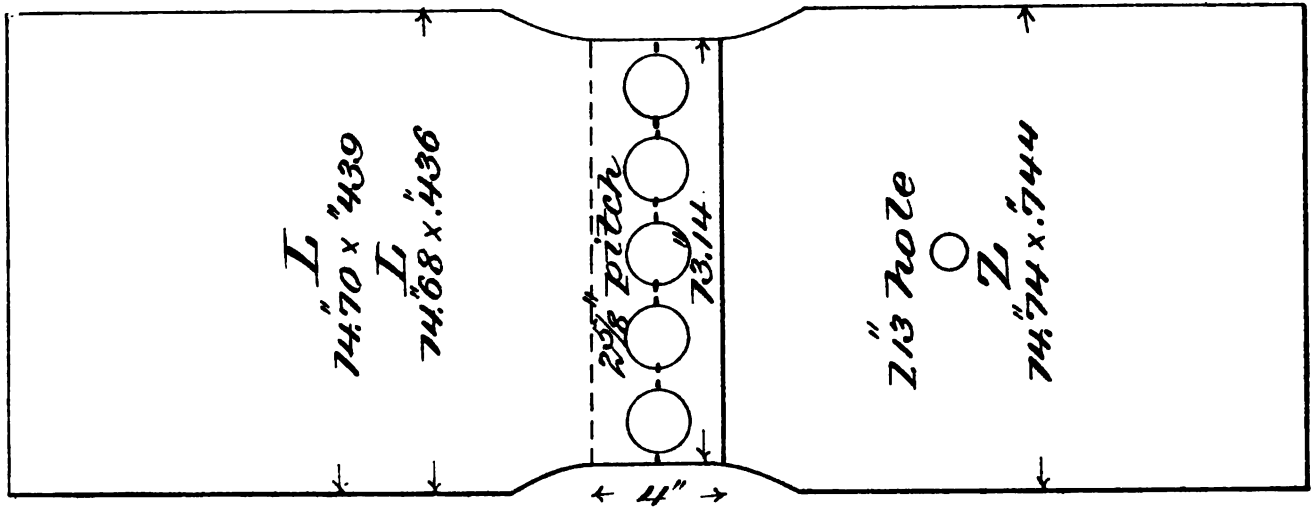
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	36,470
Tension on net section of plate	do....	63,900
Compression on bearing surface of rivets	do....	84,810
Shearing on rivets	do....	35,550

Efficiency of joint, 61.7 per cent.

No. 1499

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	9.776
Plate, net sectional area	do....	5.572
Plate, bearing surface of rivets	do....	4.204
Rivets, shearing area	do....	10.030

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,776	1,000	0.	0.	Initial load.
19,552	2,000	.0001	.....	
29,328	3,000	.0002	.....	
39,104	4,000	.0003	.....	
48,880	5,000	.0004	.0003	
58,656	6,000	.0010	.....	
68,432	7,000	.0021	.....	
78,208	8,000	.0031	.....	
87,984	9,000	.0036	.....	
97,760	10,000	.0052	.0043	
107,536	11,000	.0062	.....	
117,312	12,000	.0079	.....	
127,088	13,000	.0090	.....	
136,864	14,000	.0103	.....	
146,640	15,000	.0113	.0104	
156,416	16,000	.0121	.....	
166,192	17,000	.0128	.....	
175,968	18,000	.0138	.....	
185,744	19,000	.0177	.....	
195,520	20,000	.0194	.0176	
205,296	21,000	.0263	.....	
215,072	22,000	.0327	.....	
224,848	23,000	.0465	.....	
234,624	24,000	.0588	.....	
244,400	25,000	.0728	.....	
254,176	26,000	.0917	.....	
263,952	27,000	.1021	.....	
273,728	28,000	.13	.....	
283,504	29,000	.15	.....	
293,280	30,000	.18	.....	
303,056	31,000	.21	.....	
312,832	32,000	.24	.....	
322,608	33,000	.30	.....	
332,384	34,000	.35	.....	
342,160	35,000	.40	.....	
351,936	36,000	51	.....	
356,550	36,470	.61	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky. Open at edges ".15 and ".10.
Elongation of rivet-holes, ".70, ".70, ".70, ".70, ".72.
Area at fracture (one section), 1".24×".46=.5704 square inch.
Contraction, 48.8 per cent.

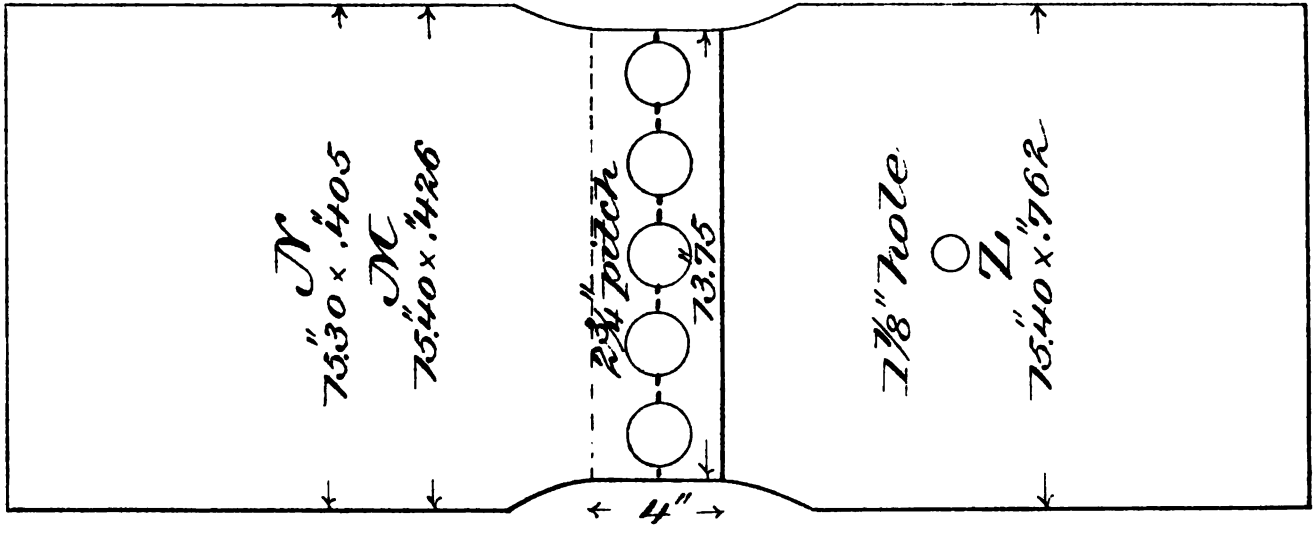
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	36,470
Tension on net section of plate	do....	63,990
Compression on bearing surface of rivets	do....	84,810
Shearing on rivets	do....	35,550

Efficiency of joint, 61.7 per cent.

No. 7500

3/4" Steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	10.478
Plate, net sectional area	do....	6.192
Plate, bearing surface of rivets	do....	4.286
Rivets, shearing area	do....	9.940

[Steel rivets.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,478	1,000	0.	0.	Initial load.
20,956	2,000	.0002	.....	
31,434	3,000	.0004	.....	
41,912	4,000	.0010	.....	
52,390	5,000	.0026	.0021	
62,868	6,000	.0053	.....	
73,346	7,000	.0075	.....	
83,824	8,000	.0092	.....	
94,302	9,000	.0105	.....	
104,780	10,000	.0115	.0100	
115,258	11,000	.0127	.....	
125,736	12,000	.0140	.....	
136,214	13,000	.0152	.....	
146,692	14,000	.0164	.....	
157,170	15,000	.0187	.0168	
167,648	16,000	.0202	.....	
178,126	17,000	.0223	.....	
188,604	18,000	.0238	.....	
199,082	19,000	.0256	.....	
209,560	20,000	.0287	.0269	
220,038	21,000	.0318	.....	
230,516	22,000	.0358	.....	
240,994	23,000	.0415	.....	
251,472	24,000	.0508	.....	
261,950	25,000	.0593	.....	
272,428	26,000	.0692	.....	
282,906	27,000	.0778	.....	
293,384	28,000	.0872	.....	
303,862	29,000	.0975	.....	
314,340	30,000	.1140	.....	
324,818	31,000	.13	.....	
335,296	32,000	.15	.....	
345,774	33,000	.17	.....	
356,252	34,000	.19	.....	
366,730	35,000	.21	.....	
377,208	36,000	.25	.....	
387,686	37,000	.29	.....	
398,164	38,000	.37	.....	
406,100	38,760	.54	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slightly lamellar.
Elongation of rivet-holes, ″.65, ″.67, ″.66, ″.63, ″.59.
Area at fracture (one section), 1″.42×″.50=.710 square inch.
Contraction, 42.6 per cent.

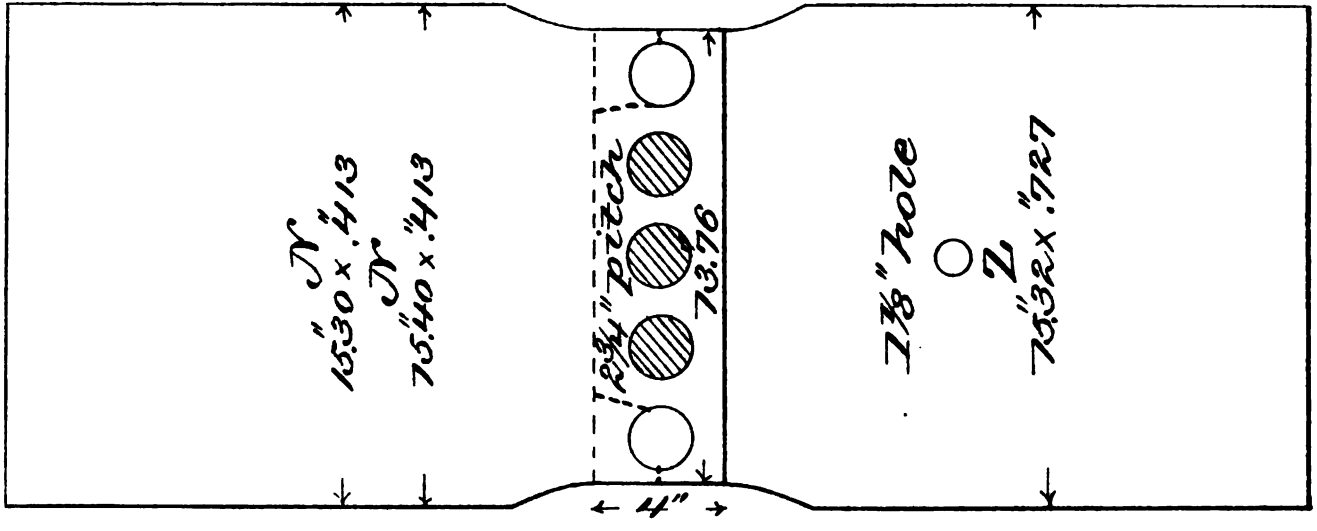
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	38,760
Tension on net section of plate	do....	65,590
Compression on bearing surface of rivets	do....	94,750
Shearing on rivets	do....	40,850

Efficiency of joint, 65.7 per cent.

No. 7501

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	10.004
Plate, net sectional area	do	5.915
Plate, bearing surface of rivets	do	4.089
Rivets, shearing area	do	9.940

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,004	1,000	0.	0.	Initial load.
20,008	2,000	.0000	.....	
30,012	3,000	.0001	.....	
40,016	4,000	−.0001	.....	
50,020	5,000	.0002	−.0001	
60,024	6,000	.0008	.....	
70,028	7,000	.0064	.....	
80,032	8,000	.0080	.....	
90,036	9,000	.0092	.0081	
100,040	10,000	.0101	.....	
110,044	11,000	.0109	.....	
120,048	12,000	.0121	.....	
130,052	13,000	.0136	.....	
140,056	14,000	.0154	.0128	
150,060	15,000	.0154	.0128	
160,064	16,000	.0171	.....	
170,068	17,000	.0189	.....	
180,072	18,000	.0211	.....	
190,076	19,000	.0242	.....	
200,080	20,000	.0286	.0231	Rested under load 10 minutes.
210,084	21,000	.0451	.....	
220,088	22,000	.0550	.....	
230,092	23,000	.0689	.....	
240,096	24,000	.0800	.....	
250,100	25,000	.0975	.0890	
260,104	26,000	.1145	.....	
270,108	27,000	.13	.....	
280,112	28,000	.15	.....	
290,116	29,000	.17	.....	
300,120	30,000	.22	.....	
310,124	31,000	.26	.....	
320,128	32,000	.29	.....	
330,132	33,000	.34	.....	
340,136	34,000	.41	.....	
350,140	35,000	.48	.....	
360,144	36,000	.58	.....	
367,500	36,740	.73	.....	Tensile strength.

Sheared three rivets and fractured plate at end sections.

Appearance of fractures, silky.

Elongation of rivet-holes (″.58, ″.52, ″.56; sheared rivets in these holes), ″.76.

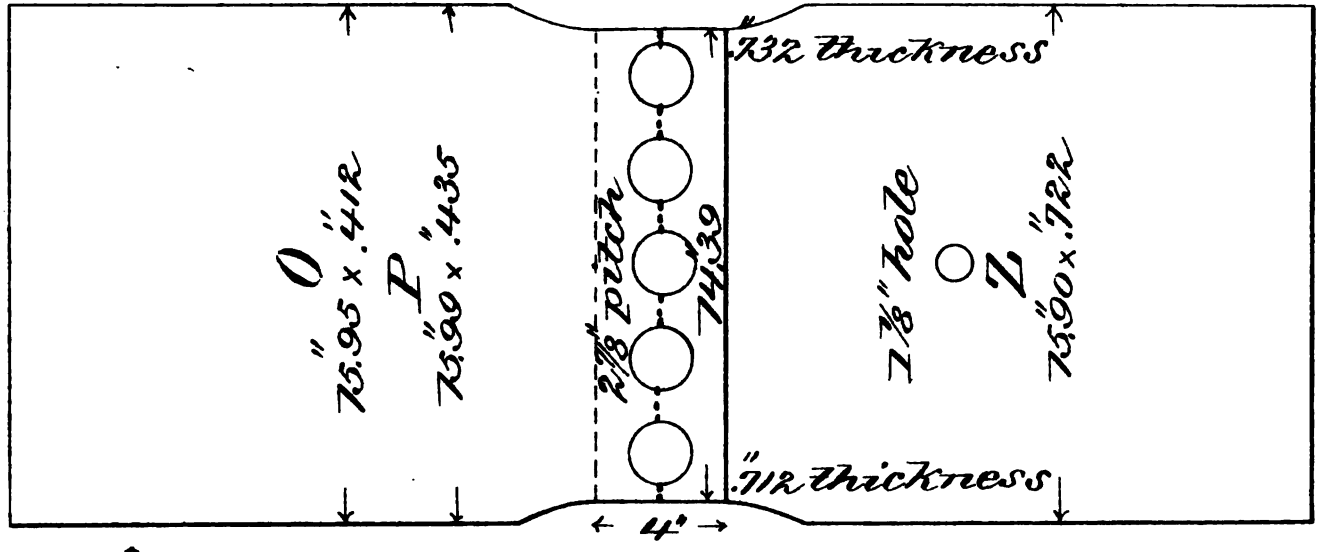
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	36,740
Tension on net section of plate	do	62,130
Compression on bearing surface of rivets	do	89,880
Shearing on rivets	do	36,970

Efficiency of joint, 62.2 per cent.

No. 7502

3/4" Steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	10.390
Plate, net sectional area	do....	6.329
Plate, bearing surface of rivets	do....	4.061
Rivets, shearing area	do....	9.940

[Steel rivets.]

Applied loads.		In ganged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,390	1,000	0.	0.	Initial load.
20,780	2,000	.0007	.....	
31,170	3,000	.0013	.....	
41,560	4,000	.0015	.....	
51,950	5,000	.0032	.0030	
62,340	6,000	.0060	.....	
72,730	7,000	.0079	.....	
83,120	8,000	.0090	.....	
92,510	9,000	.0102	.....	
103,900	10,000	.0117	.0097	
114,290	11,000	.0137	.....	
124,680	12,000	.0151	.....	
135,070	13,000	.0162	.....	
145,460	14,000	.0178	.....	
155,850	15,000	.0200	.0154	
166,240	16,000	.0217	.....	
176,630	17,000	.0226	.....	
187,020	18,000	.0234	.....	
197,410	19,000	.0250	.....	
207,800	20,000	.0284	.0223	
218,190	21,000	.0347	.....	
228,580	22,000	.0417	.....	
238,970	23,000	.0504	.....	
249,360	24,000	.0607	.....	
259,750	25,000	.0701	.0610	
270,140	26,000	.0843	.....	
280,530	27,000	.0957	.....	
290,920	28,000	.1130	.....	
301,310	29,000	.1280	.....	
311,700	30,000	.14	.....	
322,090	31,000	.18	.....	
332,480	32,000	.20	.....	
342,870	33,000	.22	.....	
353,260	34,000	.25	.....	
363,650	35,000	.29	.....	
374,040	36,000	.36	.....	
384,430	37,000	.46	.....	
394,100	37,930	.....	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slightly lamellar.
Area at fracture (one section), 1″.50×″.43=.645 square inch.
Contraction, 48.1 per cent.
Elongation of rivet-holes, ″.85, ″.74, ″.73, ″.74, ″.68.

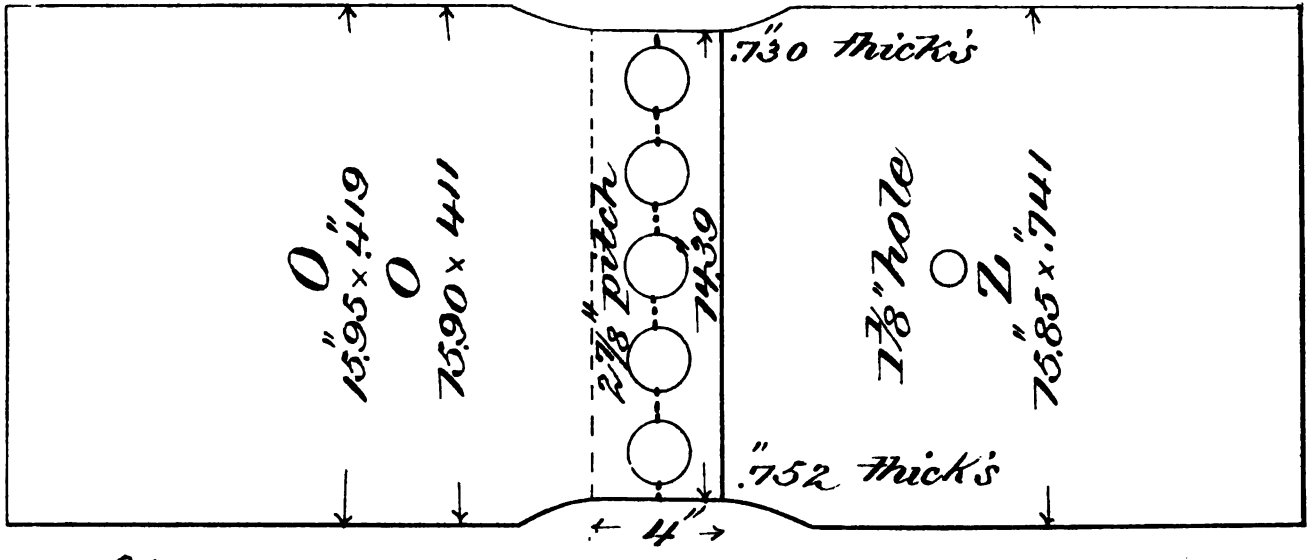
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	37,930
Tension on net section of plate	do....	62,270
Compression on bearing surface of rivets	do....	97,050
Shearing on rivets	do....	39,650

Efficiency of joint, 64.3 per cent.

No. 7503

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	10.663
Plate, net sectional area	do....	6.495
Plate, bearing surface of rivets	do....	4.168
Rivets, shearing area	do....	9.940

[Steel rivets.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,663	1,000	0.	0.	Initial load.
21,326	2,000	.0003	.....	
31,989	3,000	.0008	.....	
42,652	4,000	.0015	.....	
53,315	5,000	.0035	.0027	
63,978	6,000	.0067	.....	
74,641	7,000	.0075	.....	
85,304	8,000	.0087	.....	
95,967	9,000	.0099	.....	
106,630	10,000	.0115	.0093	
117,293	11,000	.0131	.....	
127,956	12,000	.0150	.....	
138,619	13,000	.0162	.....	
149,282	14,000	.0175	.....	
159,945	15,000	.0190	.0147	
170,608	16,000	.0202	.....	
181,271	17,000	.0212	.....	
191,934	18,000	.0226	.....	
202,597	19,000	.0243	.....	
213,260	20,000	.0254	.0191	
223,923	21,000	.0279	.....	
234,586	22,000	.0302	.....	
245,249	23,000	.0330	.....	
255,912	24,000	.0372	.....	
266,575	25,000	.0447	.0375	
277,238	26,000	.0579	.....	
287,901	27,000	.0694	.....	
298,564	28,000	.0811	.....	
309,227	29,000	.0938	.....	
319,890	30,000	.1056	.0960	
330,553	31,000	.1258	.....	
341,216	32,000	.14	.....	
351,879	33,000	.17	.....	
362,542	34,000	.19	.....	
373,205	35,000	.21	.....	
383,868	36,000	.26	.....	
394,531	37,000	.29	.....	
405,194	38,000	.36	.....	
415,857	39,000	.41	.....	
426,520	40,000	.50	.....	
433,200	40,630	.....	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky.
Area at fracture (one section), $1''.49 \times ''.47 = .6003$ square inch.
Contraction, 53.7 per cent.
Elongation of rivet-holes, ''.82, ''.72, ''.75, ''.89, ''.71.

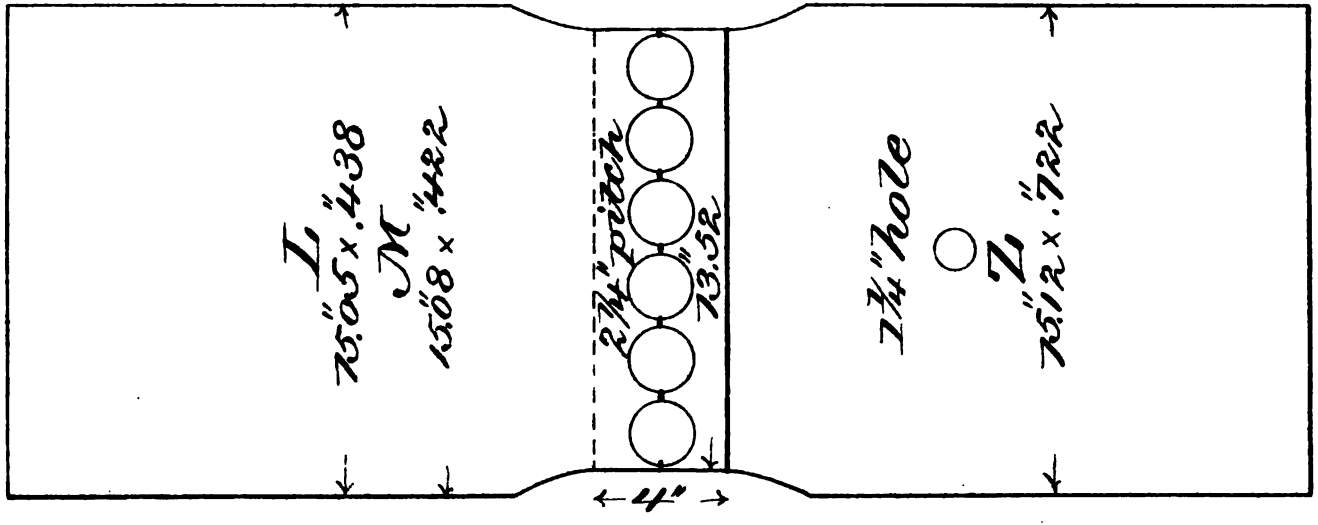
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	40,630
Tension on net section of plate	do....	65,810
Compression on bearing surface of rivets	do....	90,600
Shearing on rivets	do....	42,970

Efficiency of joint, 68.8 per cent.

No. 7504

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	9.761
Plate, net sectional area	do....	4.346
Plate, bearing surface of rivets	do....	5.415
Rivets, shearing area	do....	14.726

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,761	1,000	0.	0.	Initial load.
19,522	2,000	.0001	.....	
29,283	3,000	.0001	.....	
39,044	4,000	.0001	.....	
48,805	5,000	.0003	.0001	
58,566	6,000	.0027	.....	
68,327	7,000	.0064	.....	
78,088	8,000	.0082	.....	
87,849	9,000	.0091	.....	
97,610	10,000	.0099	.0092	
107,371	11,000	.0113	.....	
117,132	12,000	.0121	.....	
126,893	13,000	.0131	.....	
136,654	14,000	.0145	.....	
146,415	15,000	.0167	.0142	
156,176	16,000	.0188	.....	
165,937	17,000	.0206	.....	
175,698	18,000	.0224	.....	
185,459	19,000	.0251	.....	
195,220	20,000	.0331	.0276	
204,981	21,000	.0426	.....	
214,742	22,000	.0507	.....	
224,503	23,000	.0622	.....	
234,264	24,000	.0750	.....	
244,025	25,000	.0918	.0827	
253,786	26,000	.1135	.....	
263,547	27,000	.15	.....	
273,308	28,000	.18	.....	
283,069	29,000	.25	.....	
284,000	29,090	.33	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slightly lamellar. Open at edges ".12 and ".15.
Elongation of rivet-holes, ".55, ".55, ".53, ".53, ".52, ".52.
Area at fracture (one section), ".78×".46=.3588 square inch.
Contraction, 50.3 per cent.

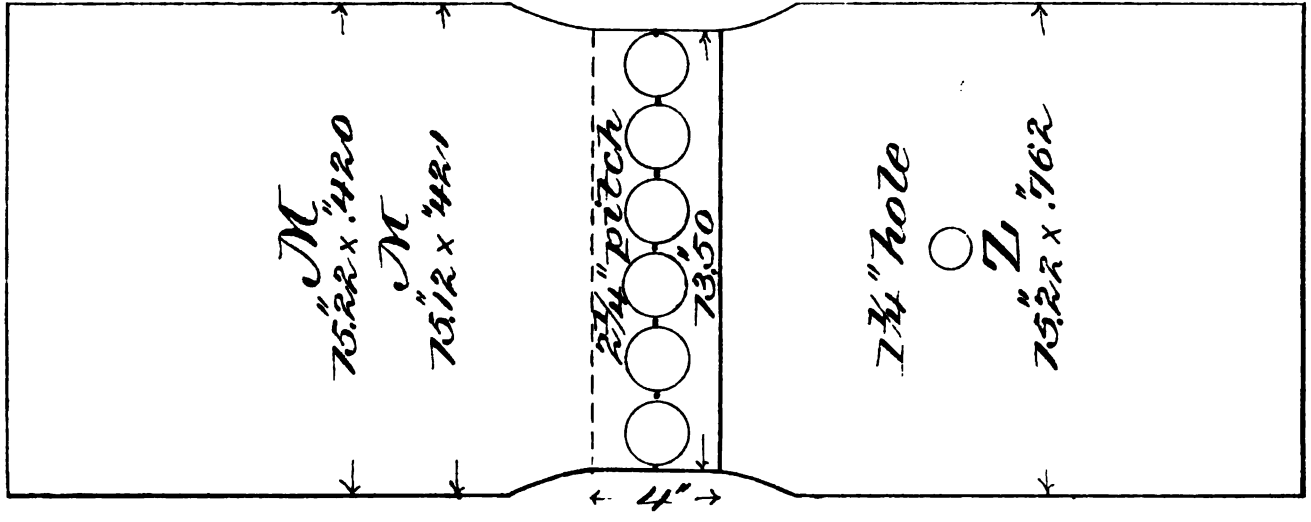
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	29,090
Tension on net section of plate	do....	65,350
Compression on bearing surface of rivets	do....	52,460
Shearing on rivets	do....	19,280

Efficiency of joint, 49.3 per cent.

No. 7505

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	10.287
Plate, net sectional area	do....	4.572
Plate, bearing surface of rivets	do....	5.715
Rivets, shearing area	do....	14.726

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,287	1,000	0.	0.	Initial load.
20,574	2,000	.0003	.....	
30,861	3,000	.0009	.....	
41,148	4,000	.0012	.....	
51,435	5,000	.0018	.0016	
61,722	6,000	.0047	.....	
72,009	7,000	.0066	.....	
82,296	8,000	.0076	.....	
92,583	9,000	.0100	.....	
102,870	10,000	.0121	.0107	
113,157	11,000	.0137	.....	
123,444	12,000	.0149	.....	
133,731	13,000	.0160	.....	
144,018	14,000	.0176	.....	
154,305	15,000	.0199	.0165	
164,592	16,000	.0219	.....	
174,879	17,000	.0235	.....	
185,166	18,000	.0252	.....	
195,453	19,000	.0289	.....	
205,740	20,000	.0350	.0292	
216,027	21,000	.0442	.....	
226,314	22,000	.0512	.....	
236,601	23,000	.0629	.....	
246,888	24,000	.0745	.....	
257,175	25,000	.0894	.0797	
267,462	26,000	.1132	.....	
278,749	27,000	.14	.....	
285,036	28,000	.16	.....	
298,323	29,000	.21	.....	
308,610	30,000	.30	.....	
308,680	30,010	.32	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky. Open at edges ".03 and ".05.
Elongation of rivet-holes, ".50, ".50, ".48, ".48, "47, ".47.
Area at fracture (one section), ".82×".50=.41 square inch.
Contraction, 46.1 per cent.

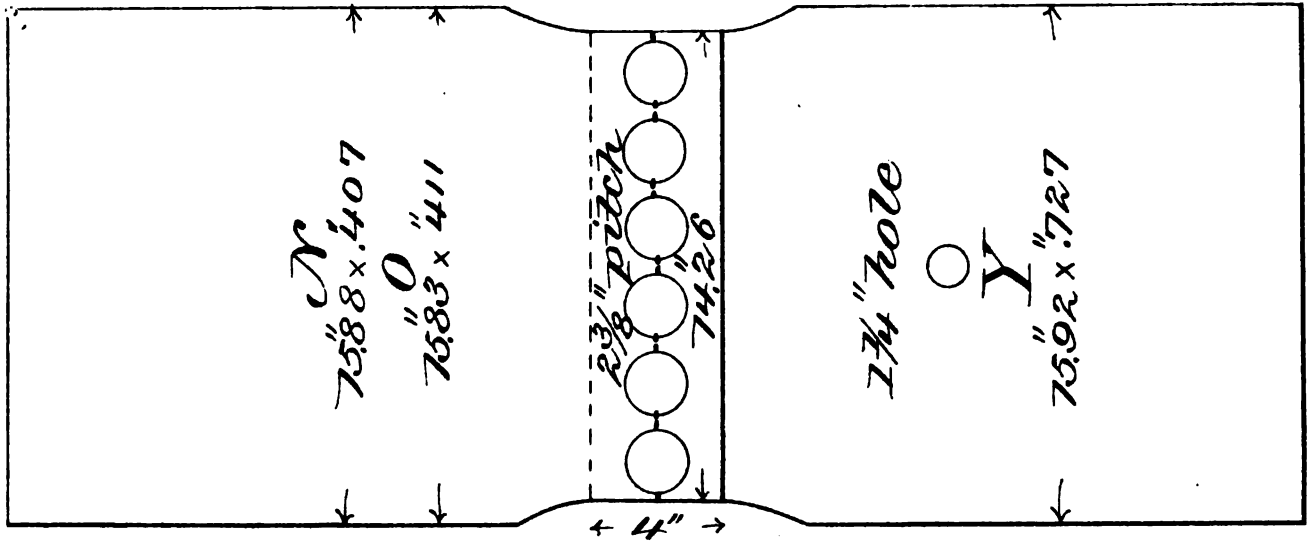
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	30,010
Tension on net section of plate	do....	67,520
Compression on bearing surface of rivets	do....	54,010
Shearing on rivets	do....	20,960

Efficiency of joint, 50.8 per cent.

No. 1506

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	10.367
Plate, net sectional area	do....	4.914
Plate, bearing surface of rivets	do....	5.453
Rivets, shearing area	do....	14.726

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,367	1,000	0.	0.	Initial load.
20,734	2,000	.0001	.....	
31,101	3,000	.0004	.....	
41,468	4,000	.0009	.....	
51,835	5,000	.0046	.0045	
62,202	6,000	.0060	.....	
72,569	7,000	.0066	.....	
82,936	8,000	.0077	.....	
93,303	9,000	.0131	.....	
103,670	10,000	.0151	.0140	
114,037	11,000	.0165	.....	
124,404	12,000	.0176	.....	
134,771	13,000	.0186	.....	
145,138	14,000	.0195	.....	
155,505	15,000	.0205	.0177	
165,872	16,000	.0223	.....	
176,239	17,000	.0241	.....	
186,606	18,000	.0269	.....	
196,973	19,000	.0295	.....	
207,340	20,000	.0331	.0270	
217,707	21,000	.0391	.....	
228,074	22,000	.0457	.....	
238,441	23,000	.0550	.....	
248,808	24,000	.0640	.....	
259,175	25,000	.0741	.0649	
269,542	26,000	.0891	.....	
279,909	27,000	.1050	.....	
290,276	28,000	.1260	.....	
300,643	29,000	.15	.....	
311,010	30,000	.17	.....	
321,377	31,000	.20	.....	
331,744	32,000	.26	.....	
342,111	33,000	.29	.....	
348,400	33,610	.38	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slightly lamellar.
Elongation of rivet-holes, ".47 each.
Area at fracture (one section), ".94×".50=.4700 square inch.
Contraction, 42.5 per cent.

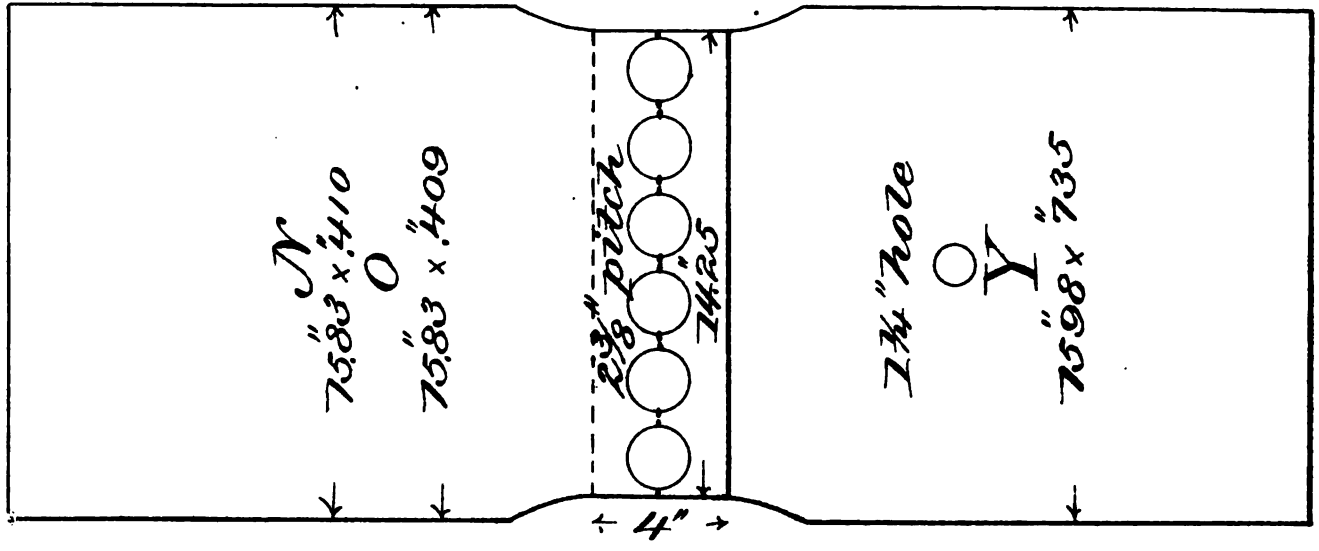
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	33,610
Tension on net section of plate	do....	70,900
Compression on bearing surface of rivets	do....	63,890
Shearing on rivets	do....	23,660

Efficiency of joint, 55.6 per cent.

No. 1507

3/4" Steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	10.474
Plate, net sectional area	do....	4.961
Plate, bearing surface of rivets	do....	5.513
Rivets, shearing area	do....	14.726

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,474	1,000	0.	0.	Initial load.
20,948	2,000	—.0001	.....	
31,422	3,000	—.0001	.....	
41,896	4,000	.0000	.....	
52,370	5,000	.0005	.0005	
62,844	6,000	.0023	.....	
73,318	7,000	.0040	.....	
83,792	8,000	.0086	.....	
91,266	9,000	.0098	.....	
104,740	10,000	.0110	.0102	
115,214	11,000	.0121	.....	
125,688	12,000	.0129	.....	
136,162	13,000	.0137	.....	
146,636	14,000	.0144	.....	
157,110	15,000	.0156	.0141	
167,584	16,000	.0174	.....	
178,058	17,000	.0191	.....	
188,532	18,000	.0206	.....	
199,006	19,000	.0223	.....	
209,480	20,000	.0235	.0191	
219,954	21,000	.0267	.....	
230,428	22,000	.0311	.....	
240,902	23,000	.0371	.....	
251,376	24,000	.0449	.....	
261,850	25,000	.0549	.0517	
272,324	26,000	.0706	.....	
282,798	27,000	.0862	.....	
293,272	28,000	.1043	.....	
303,746	29,000	.1261	.....	
314,220	30,000	.15	.....	
324,694	31,000	.18	.....	
335,168	32,000	.23	.....	
345,642	33,000	.28	.....	
352,600	33,660	.37	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky. Open at edges ".10 and ".08.
Elongation of rivet-holes, ".51, ".50, ".50, ".50, ".50, ".49.
Area at fracture (one section), ".90×".47=.4230 square inch.
Contraction, 48.8 per cent.

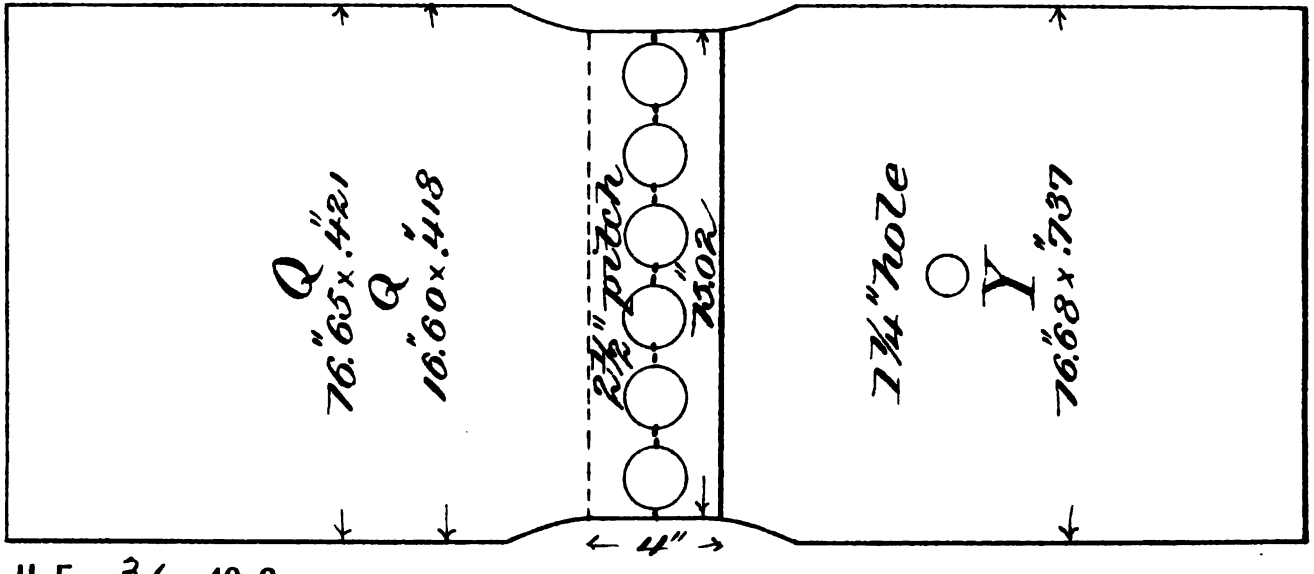
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	33,660
Tension on net section of plate	do....	71,070
Compression on bearing surface of rivets	do....	63,960
Shearing on rivets	do....	23,940

Efficiency of joint, 55.7 per cent.

No 1508

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	11.070
Plate, net sectional area	do....	5.542
Plate, bearing surface of rivets	do....	5.528
Rivets, shearing area	do....	11.726

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds..*	*Inch.*	*Inch.*	
11,070	1,000	0.	0.	Initial load.
22,140	2,000	.0000	.....	
33,210	3,000	.0001	.....	
44,280	4,000	.0005	.....	
55,350	5,000	.0011	.0010	
66,420	6,000	.0044	.....	
77,490	7,000	.0055	.....	
88,560	8,000	.0064	.....	
99,630	9,000	.0076	.....	
110,700	10,000	.0101	.0091	
121,770	11,000	.0133	.....	
132,840	12,000	.0148	.....	
143,910	13,000	.0159	.....	
154,980	14,000	.0170	.....	
166,050	15,000	.0181	.0160	
177,120	16,000	.0198	.....	
188,190	17,000	.0211	.....	
199,260	18,000	.0241	.....	
210,330	19,000	.0290	.....	
221,400	20,000	.0343	.0238	
232,470	21,000	.0403	.....	
243,540	22,000	.0445	.....	
254,610	23,000	.0530	.....	
265,680	24,000	.0618	.....	
276,750	25,000	.0732	.0648	
287,820	26,000	.0890	.....	
298,890	27,000	.1076	.....	
309,960	28,000	.1291	.....	
321,030	29,000	.16	.....	
332,100	30,000	.18	.....	
343,170	31,000	.21	.....	
354,240	32,000	.26	.....	
365,310	33,000	.30	.....	
376,380	34,000	.38	.....	
385,000	34,780	.48	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, lamellar. Open at edges ″.08 each.
Elongation of rivet-holes, ″.53, ″.53, ″.50, ″.47, ″49, ″.52.
Area at fracture (one section), 1″.06×″.51=.5406 square inch.
Contraction, 41.3 per cent.

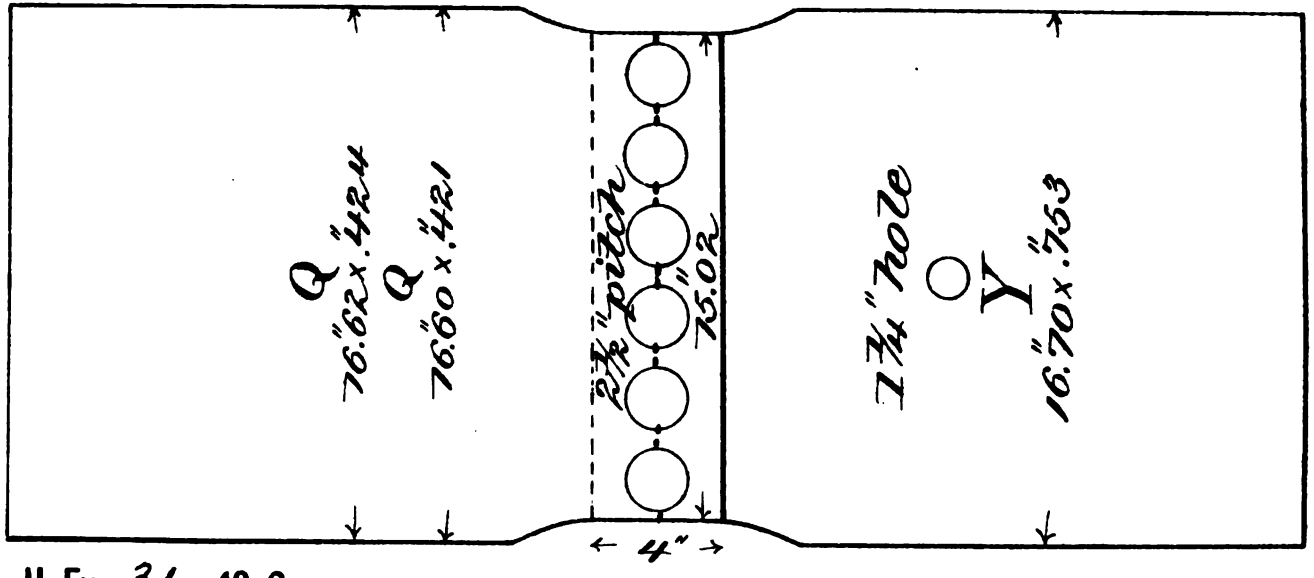
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	34,780
Tension on net section of plate	do....	69,470
Compression on bearing surface of rivets	do....	69,650
Shearing on rivets	do....	26,140

Efficiency of joint, 57.5 per cent.

No. 1509

¾" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	11.310
Plate, net sectional area	do	5.662
Plate, bearing surface of rivets	do	5.648
Rivets, shearing area	do	14.726

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
11,310	1,000	0.	0.	Initial load.
22,620	2,000	.0003	.....	
33,930	3,000	.0005	.....	
45,240	4,000	.0008	.....	
56,550	5,000	.0012	.0008	
67,860	6,000	.0018	.....	
79,170	7,000	.0028	.....	
90,480	8,000	.0065	.....	
101,790	9,000	.0079	.....	
113,100	10,000	.0090	.0085	
124,410	11,000	.0105	.....	
135,720	12,000	.0123	.....	
147,030	13,000	.0135	.....	
158,340	14,000	.0167	.....	
169,650	15,000	.0183	.0165	
180,960	16,000	.0205	.....	
192,270	17,000	.0221	.....	
203,580	18,000	.0233	.....	
214,890	19,000	.0250	.....	
226,200	20,000	.0290	.0245	
237,510	21,000	.0315	.....	
248,820	22,000	.0430	.....	
260,130	23,000	.0550	.....	
271,440	24,000	.0630	.....	
282,750	25,000	.0720	.....	
294,060	26,000	.0825	.0752	
305,370	27,000	.1039	.....	
316,680	28,000	.1250	.....	
327,990	29,000	.15	.....	
339,300	30,000	.17	.....	
350,610	31,000	.21	.....	
361,920	32,000	.26	.....	
373,230	33,000	.30	.....	
384,540	34,000	.37	.....	
392,100	34,670	.48	.....	Tensile strength.

Fractured plate along line of riveting.

Appearance, silky, lamellar, except one end section, which was granular in part, radiating from silky metal next rivet-hole. Open at edges ".12 and ".10.

Area at fracture (one section), 1".04×".51=.5304 square inch.

Contraction, 43.6 per cent.

Elongation of rivet-holes, ".58, ".55, ".52, ".52, ".53, ".56.

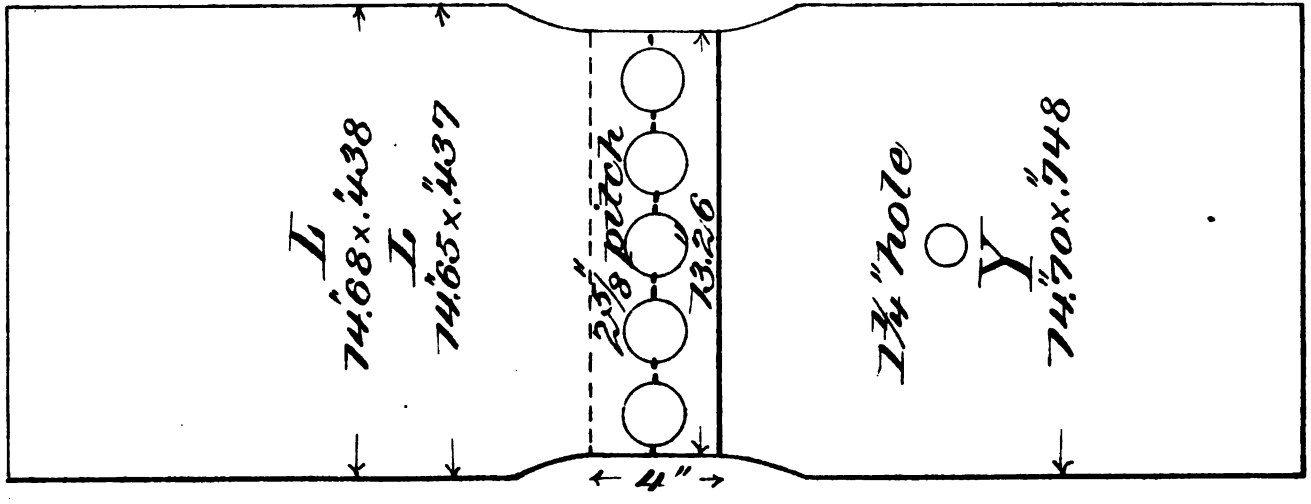
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	34,670
Tension on net section of plate	do	60,250
Compression on bearing surface of rivets	do	69,420
Shearing on rivets	do	26,620

Efficiency of joint, 57.4 per cent.

No. 7510

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	9.918
Plate, net sectional area	do....	5.243
Plate, bearing surface of rivets	do....	4.675
Rivets, shearing area	do....	12.272

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,918	1,000	0.	0.	Initial load.
19,836	2,000	.0001	.....	
29,754	3,000	.0003	.....	
39,672	4,000	.0006	.....	
49,590	5,000	.0009	.0002	
59,508	6,000	.0017	.....	
69,426	7,000	.0028	.....	
79,344	8,000	.0042	.....	
89,262	9,000	.0062	.....	
99,180	10,000	.0088	.0056	
109,098	11,000	.0109	.....	
119,016	12,000	.0127	.....	
128,934	13,000	.0144	.....	
138,852	14,000	.0169	.....	
148,770	15,000	.0189	.0139	
158,688	16,000	.0213	.....	
168,606	17,000	.0230	.....	
178,524	18,000	.0253	.....	
188,442	19,000	.0285	.....	
198,360	20,000	.0323	.0242	
208,278	21,000	.0377	.....	
218,196	22,000	.0426	.....	
228,114	23,000	.0510	.....	
238,032	24,000	.0655	.....	
247,950	25,000	.0803	.0690	
257,868	26,000	.0976	.....	
267,786	27,000	.1142	.....	
277,704	28,000	.14	.....	
287,622	29,000	.16	.....	
297,540	30,000	.18	.....	
307,458	31,000	.20	.....	
317,376	32,000	.25	.....	
327,294	33,000	.27	.....	
337,212	34,000	.33	.....	
347,130	35,000	.39	.....	
357,048	36,000	.51	.....	
358,500	36,120	.58	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, lamellar. Open at one edge ".05.
Elongation of rivet-holes, ".61, ".61, ".63, ".63, ".61.
Area at fracture (one section), 1".17 × ".50 = .585 square inch.
Contraction, 43.1 per cent.

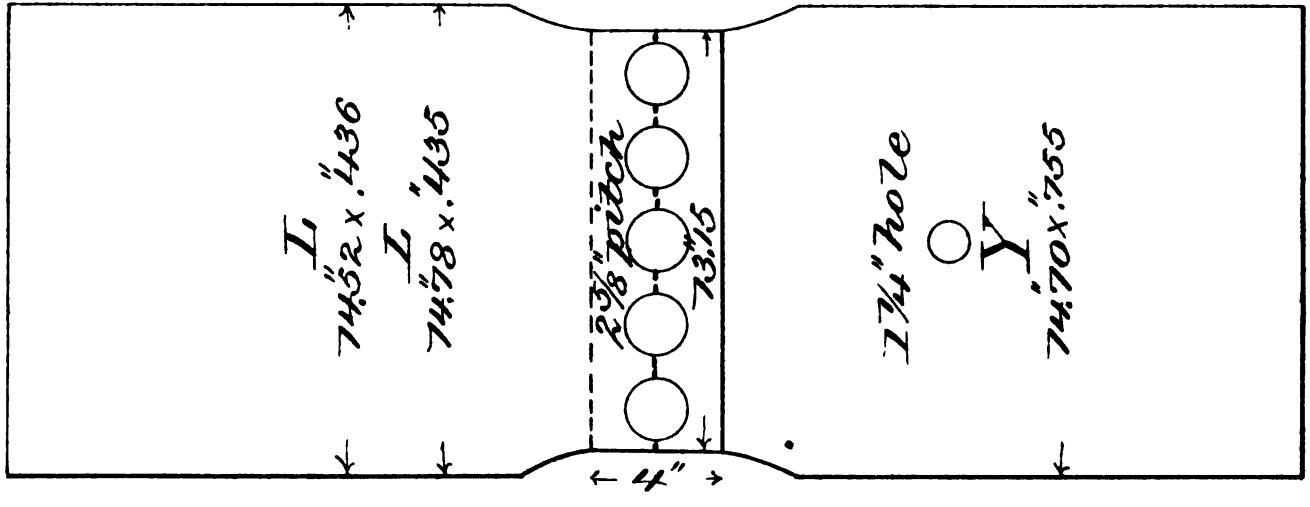
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch....	36,120
Tension on net section of plate	do....	68,380
Compression on bearing surface of rivets	do....	76,680
Shearing on rivets	do....	29,210

Efficiency of joint, 59.7 per cent.

No. 7511

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	9.928
Plate, net sectional area	do....	5.209
Plate, bearing surface of rivets	do....	4.719
Rivets, shearing area	do....	12.272

Applied loads.		In ganged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,928	1,000	0.	0.	Initial load.
19,856	2,000	.0004	.....	
29,784	3,000	.0008	.....	
39,712	4,000	.0010	.....	
49,640	5,000	.0015	.0009	
59,568	6,000	.0030	.....	
69,496	7,000	.0090	.....	
79,424	8,000	.0110	.....	
89,352	9,000	.0127	.....	
99,280	10,000	.0139	.0116	
109,208	11,000	.0148	.....	
119,136	12,000	.0161	.....	
129,064	13,000	.0177	.....	
138,992	14,000	.0198	.....	
148,920	15,000	.0220	.0190	
158,848	16,000	.0235	.....	
168,776	17,000	.0250	.....	
178,704	18,000	.0265	.....	
188,632	19,000	.0278	.....	
198,560	20,000	.0299	.0235	
208,488	21,000	.0330	.....	
218,416	22,000	.0370	.....	
228,344	23,000	.0451	.....	
238,272	24,000	.0605	.....	
248,200	25,000	.0787	.0685	
258,128	26,000	.0964	.....	
268,056	27,000	.1110	.....	
277,984	28,000	.14	.....	
287,912	29,000	.15	.....	
297,840	30,000	.18	.....	
307,768	31,000	.21	.....	
317,696	32,000	.25	.....	
327,624	33,000	.28	.....	
337,552	34,000	.32	.....	
347,480	35,000	.37	.....	
357,408	36,000	.46	.....	
366,700	36,940	.58	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slightly lamellar. Open at edges ″.12 and ″.05.
Elongation of rivet-holes, ″.57, ″.57, ″.57, ″.58, ″.57.
Area at fracture (one section), 1″.16×″.52=.6032 square inch.
Contraction, 41.8 per cent.

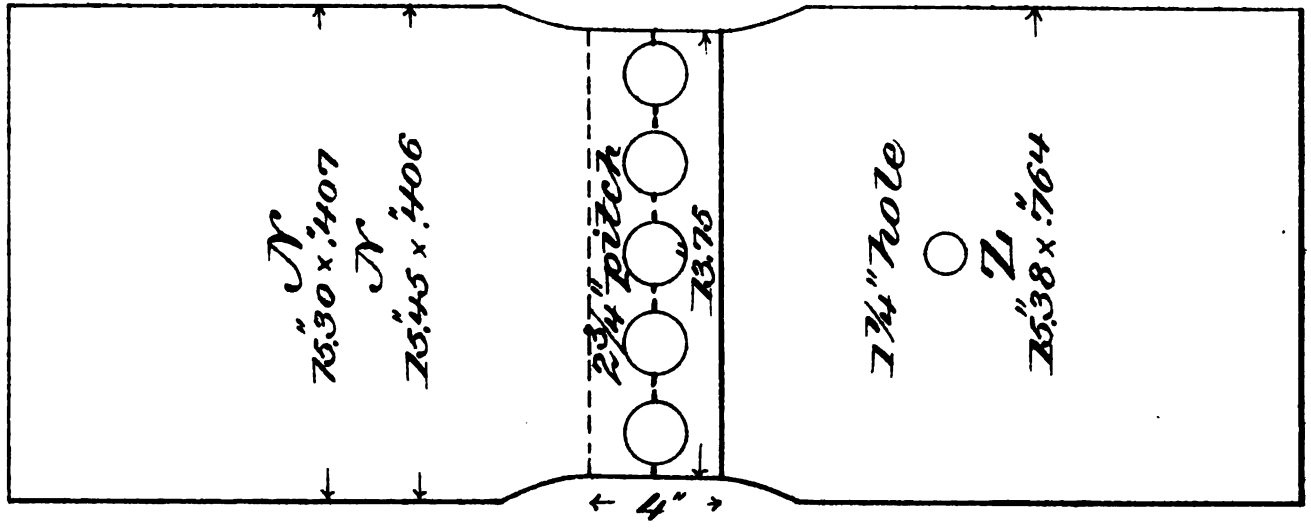
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	36,940
Tension on net section of plate	do....	70,400
Compression on bearing surface of rivets	do....	77,710
Shearing on rivets	do....	29,880

Efficiency of joint, 61.1 per cent.

No. 7513

¾" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	10.505
Plate, net sectional area	do	5.730
Plate, bearing surface of rivets	do	4.775
Rivets, shearing area	do	12.272

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,505	1,000	0.	0.	Initial load.
21,010	2,000	.0004	.....	
31,515	3,000	.0008	.....	
42,020	4,000	.0011	.....	
52,525	5,000	.0015	.0009	
63,030	6,000	.0073	.....	
73,585	7,000	.0093	.....	
84,040	8,000	.0101	.....	
94,545	9,000	.0145	.....	
105,050	10,000	.0165	.0158	
115,555	11,000	.0193	.....	
126,060	12,000	.0213	.....	
136,565	13,000	.0228	.....	
147,070	14,000	.0243	.....	
157,575	15,000	.0258	.0241	
168,080	16,000	.0297	.....	
178,585	17,000	.0338	.....	
189,090	18,000	.0360	.....	
199,595	19,000	.0395	.....	
210,100	20,000	.0464	.0383	
220,605	21,000	.0545	.....	
231,110	22,000	.0637	.....	
241,615	23,000	.0762	.....	
252,120	24,000	.0899	.....	
262,625	25,000	.1051	.0938	
273,130	26,000	.11	.....	
283,635	27,000	.14	.....	
294,140	28,000	.16	.....	
304,645	29,000	.19	.....	
315,150	30,000	.23	.....	
325,655	31,000	.27	.....	
336,160	32,000	.31	.....	
346,665	33,000	.37	.....	
357,170	34,000	.44	.....	
367,675	35,000	.55	.....	
370,400	35,260	.61	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky. Open at edges ″.30 and ″.20.
Elongation of rivet-holes, ″.71, ″.68, ″.64, ″.65, ″.67.
Area at fracture (one section), 1″.26×″.51=.6426 square inch.
Contraction, 43.9 per cent.

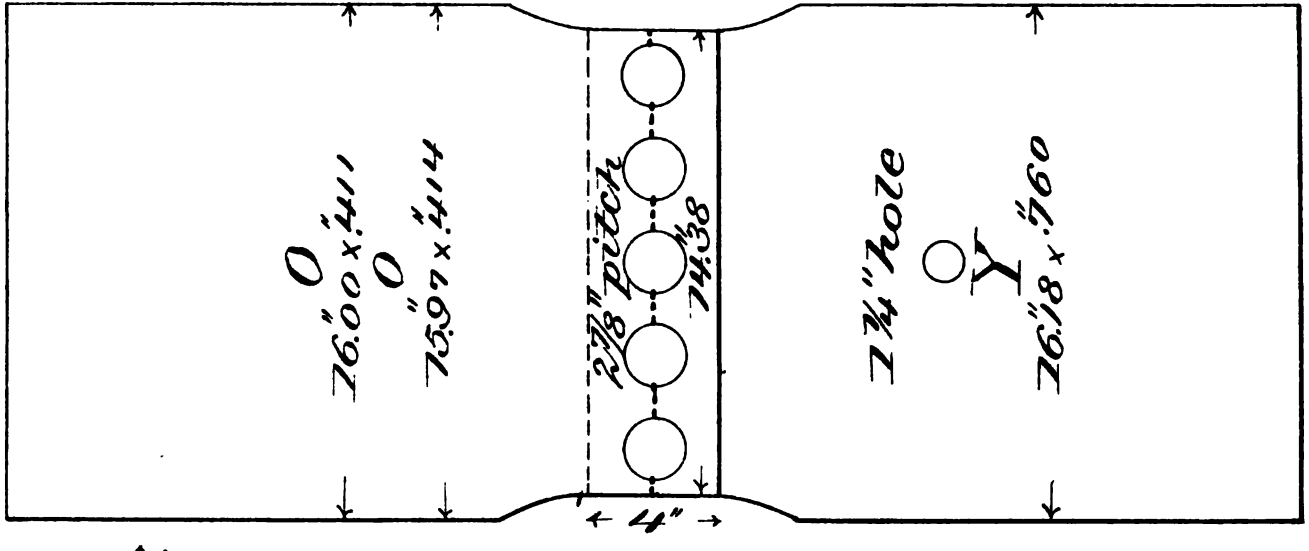
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	35,260
Tension on net section of plate	do	64,640
Compression on bearing surface of rivets	do	77,570
Shearing on rivets	do	30,100

Efficiency of joint, 59.7 per cent.

No. 7574

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	10.929
Plate, net sectional area	do....	6.179
Plate, bearing surface of rivets	do....	4.750
Rivets, shearing area	do....	12.272

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,920	1,000	0.	0.	Initial load.
21,858	2,000	.0002	.....	
32,787	3,000	.0002	.....	
43,716	4,000	.0001	.....	
54,645	5,000	.0046	.0051	
65,574	6,000	.0078	.....	
76,503	7,000	.0098	.....	
87,432	8,000	.0110	.....	
98,361	9,000	.0126	.....	
109,290	10,000	.0133	.0131	
120,219	11,000	.0150	.....	
131,148	12,000	.0159	.....	
142,077	13,000	.0182	.....	
153,006	14,000	.0194	.....	
163,935	15,000	.0209	.0198	
174,864	16,000	.0223	.....	
185,793	17,000	.0242	.....	
196,722	18,000	.0263	.....	
207,651	19,000	.0283	.....	
218,580	20,000	.0308	.0261	
229,509	21,000	.0322	.....	
240,438	22,000	.0423	.....	
251,367	23,000	.0618	.....	
262,296	24,000	.0750	.....	
273,225	25,000	.0890	.0617	
284,154	26,000	.1058	.....	
295,083	27,000	.1225	.....	
306,012	28,000	.16	.....	
316,941	29,000	.19	.....	
327,870	30,000	.21	.....	
338,799	31,000	.26	.....	
349,728	32,000	.29	.....	
360,657	33,000	.35	.....	
371,586	34,000	.39	.....	
382,515	35,000	.46	.....	
393,444	36,000	.54	.....	
404,373	37,000	.63	.....	
414,500	37,930	.86	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slightly lamellar. Open at edges ″.15 and ″.12.
Area at fracture (one section), 1″.39×″.52=.7228 square inch.
Contraction, 41.4 per cent.
Elongation of rivet-holes, ″.70, ″.72, ″75, ″.85, ″.85.

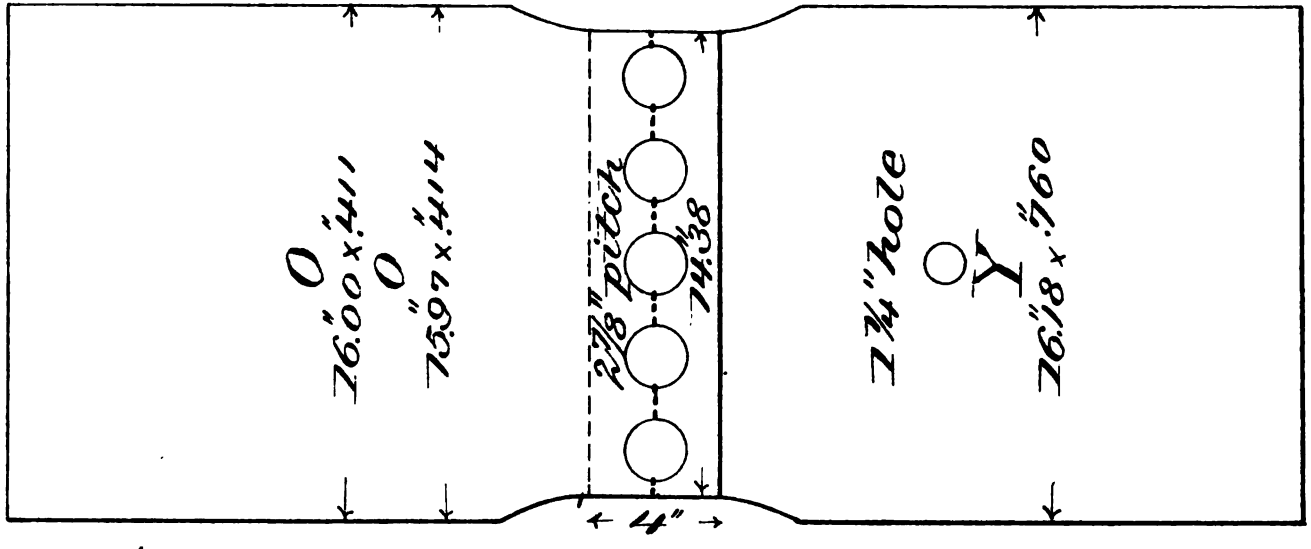
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	37,930
Tension on net section of plate	do....	67,960
Compression on bearing surface of rivets	do....	87,200
Shearing on rivets	do....	36,220

Efficiency of joint, 62.7 per cent.

No. 7574

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	10.929
Plate, net sectional area	do....	6.179
Plate, bearing surface of rivets	do....	4.750
Rivets, shearing area	do....	12.272

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,920	1,000	0.	0.	Initial load.
21,858	2,000	.0002	.....	
32,787	3,000	.0002	.....	
43,716	4,000	.0001	.....	
54,645	5,000	.0046	.0051	
65,574	6,000	.0078	.....	
76,503	7,000	.0098	.....	
87,432	8,000	.0110	.....	
98,361	9,000	.0126	.....	
109,290	10,000	.0133	.0131	
120,219	11,000	.0150	.....	
131,148	12,000	.0159	.....	
142,077	13,000	.0182	.....	
153,006	14,000	.0194	.....	
163,935	15,000	.0209	.0198	
174,864	16,000	.0222	.....	
185,793	17,000	.0242	.....	
196,722	18,000	.0263	.....	
207,651	19,000	.0283	.....	
218,580	20,000	.0308	.0261	
229,509	21,000	.0382	.....	
240,438	22,000	.0493	.....	
251,367	23,000	.0618	.....	
262,296	24,000	.0750	.....	
273,225	25,000	.0890	.0817	
284,164	26,000	.1058	.....	
295,083	27,000	.1225	.....	
306,012	28,000	.16	.....	
316,941	29,000	.19	.....	
327,870	30,000	.21	.....	
338,799	31,000	.26	.....	
349,728	32,000	.29	.....	
360,657	33,000	.35	.....	
371,586	34,000	.39	.....	
382,515	35,000	.46	.....	
393,444	36,000	.54	.....	
404,373	37,000	.63	.....	
414,500	37,930	.86	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, slightly lamellar. Open at edges ″.15 and ″.12.
Area at fracture (one section), 1″.39×″.52=.7228 square inch.
Contraction, 41.4 per cent.
Elongation of rivet-holes, ″.70, ″.72, ″75, ″.85, ″.85.

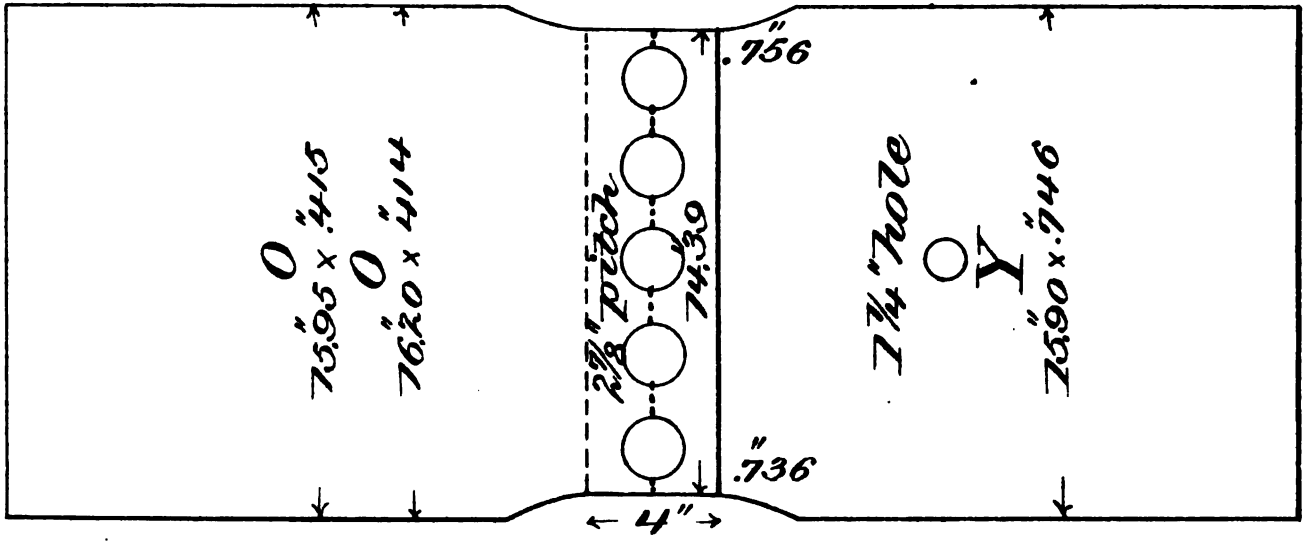
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	37,930
Tension on net section of plate	do....	67,080
Compression on bearing surface of rivets	do....	87,200
Shearing on rivets	do....	36,220

Efficiency of joint, 62.7 per cent.

No. 1515

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	10.735
Plate, net sectional area	do....	6.072
Plate, bearing surface of rivets	do....	4.663
Rivets, shearing area	do....	12.272

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,735	1,000	0.	0.	Initial load.
21,470	2,000	—.0001	.....	
32,205	3,000	—.0001	.....	
42,940	4,000	.0000	.....	
53,675	5,000	.0003	.0001	
64,410	6,000	.0021	.....	
75,145	7,000	.0036	.....	
85,880	8,000	.0080	.....	
96,615	9,000	.0106	.....	
107,350	10,000	.0120	.0113	
118,085	11,000	.0136	.....	
128,820	12,000	.0144	.....	
139,555	13,000	.0156	.....	
150,290	14,000	.0166	.....	
161,025	15,000	.0183	.0153	
171,760	16,000	.0206	.....	
182,495	17,000	.0221	.....	
193,230	18,000	.0251	.....	
203,965	19,000	.0264	.....	
214,700	20,000	.0272	.0226	
225,435	21,000	.0308	.....	
236,170	22,000	.0341	.....	
246,905	23,000	.0412	.....	
257,640	24,000	.0556	.....	
268,375	25,000	.0736	.0648	
279,110	26,000	.0806	.....	
289,845	27,000	.1044	.....	
300,580	28,000	.14	.....	
311,315	29,000	.16	.....	
322,050	30,000	.18	.....	
332,785	31,000	.21	.....	
343,520	32,000	.26	.....	
354,255	33,000	.29	.....	
364,990	34,000	.34	.....	
375,725	35,000	.39	.....	
386,460	36,000	.46	.....	
397,195	37,000	.56	.....	
403,600	37,600	.62	.....	
415,700	38,720	.85	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky, lamellar. Open at edges ″.25 and ″.10.
Elongation of rivet-holes, ″.80, ″.78, ″.75, ″.75, ″.73.
Area at fracture (one section), 1″.42×″.51=.7242 square inch.
Contraction, 40.2 per cent.

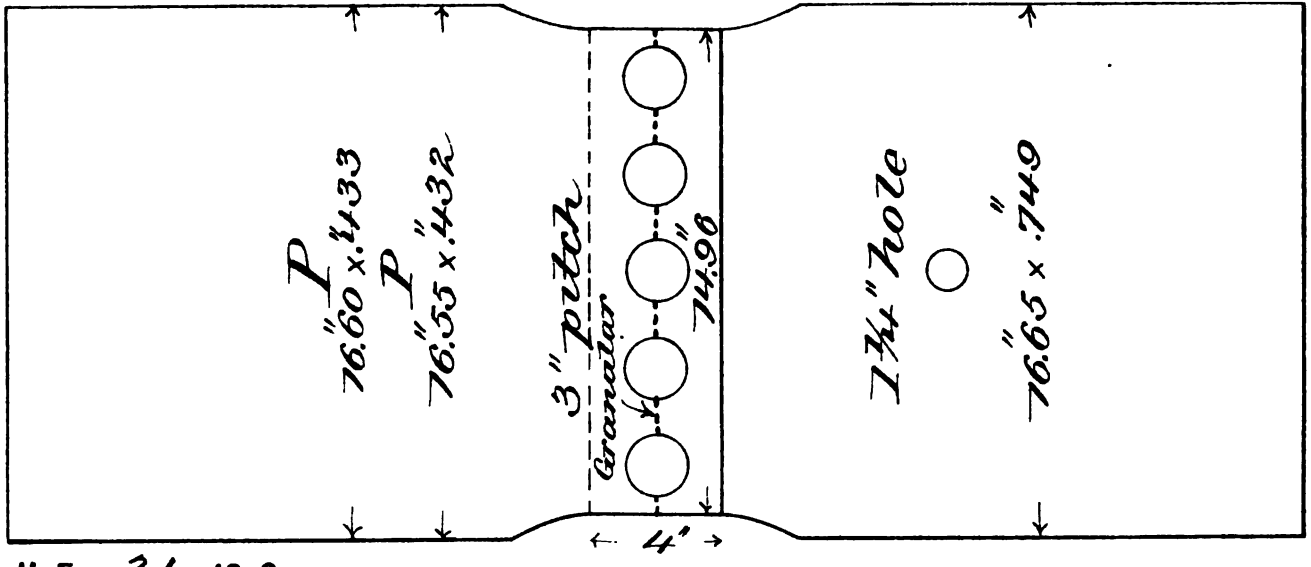
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	38,720
Tension on net section of plate	do....	68,460
Compression on bearing surface of rivets	do....	89,150
Shearing on rivets	do....	32,870

Efficiency of joint, 84.0 per cent.

No. 7516

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	11.205
Plate, net sectional area	do....	6.524
Plate, bearing surface of rivets	do....	4.681
Rivets, shearing area	do....	12.272

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
11,205	1,000	0.	0.	Initial load.
22,410	2,000	.0000	.....	
33,615	3,000	.0001	.....	
44,820	4,000	.0005	.....	
56,025	5,000	.0018	.0010	
67,230	6,000	.0027	.....	
78,435	7,000	.0042	.....	
89,640	8,000	.0077	.....	
100,845	9,000	.0107	.....	
112,050	10,000	.0137	.0113	
123,255	11,000	.0167	.....	
134,460	12,000	.0182	.....	
145,665	13,000	.0194	.....	
156,870	14,000	.0208	.....	
168,075	15,000	.0227	.0177	
179,280	16,000	.0244	.....	
190,485	17,000	.0266	.....	
201,690	18,000	.0288	.....	
212,895	19,000	.0315	.....	
224,100	20,000	.0357	.0277	
235,305	21,000	.0388	.....	
246,510	22,000	.0544	.....	
257,715	23,000	.0685	.....	
268,920	24,000	.0895	.....	
280,125	25,000	.0977	.0851	
291,330	26,000	.1163	.....	
302,535	27,000	.1350	.....	
313,740	28,000	.16	.....	
324,945	29,000	.19	.....	
336,150	30,000	.22	.....	
347,355	31,000	.27	.....	
358,560	32,000	.31	.....	
369,765	33,000	.37	.....	
380,970	34,000	.42	.....	
392,175	35,000	.45	.....	
403,380	36,000	.62	.....	
409,300	36,530	.78	.....	Tensile strength.

Fractured plate along line of riveting.

Appearance, five fractured sections silky, one section granular.

A sharp report preceded the final fracture of the plate, attributed to the rupture of the granular section.

Area at fracture: One silky section, 1″.52×″.48=.7296 square inch; contraction, 44.3 per cent. One granular section, 1″.62×″.57=.9234 square inch; contraction, 29.5 per cent.

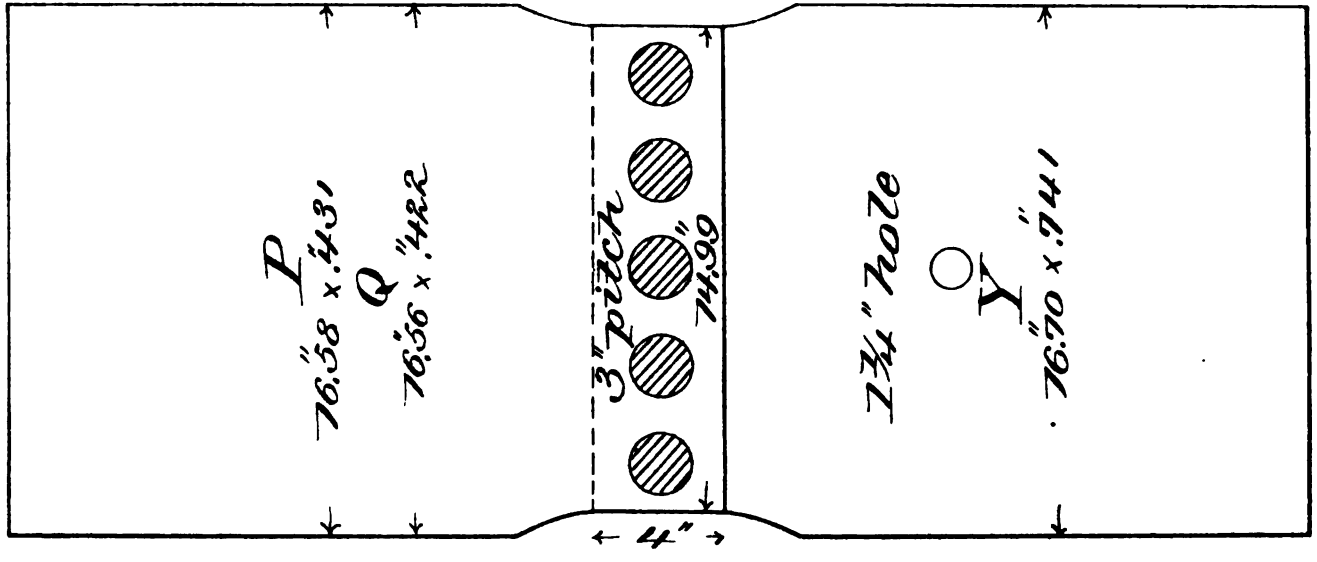
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	36,530
Tension on net section of plate	do....	62,740
Compression on bearing surface of rivets	do....	87,440
Shearing on rivets	do....	36,610

Efficiency of joint, 65.8 per cent.

No. 7517

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	11.108
Plate, net sectional area	do....	6.477
Plate, bearing surface of rivets	do....	4.631
Rivets, shearing area	do....	12.372

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
11,108	1,000	0.	0.	Initial load.
22,216	2,000	0.	.....	
33,324	3,000	.0002	.....	
44,432	4,000	.0013	.....	
55,540	5,000	.0020	.0020	
66,648	6,000	.0030	.....	
77,756	7,000	.0086	.....	
88,864	8,000	.0109	.....	
99,972	9,000	.0132	.....	
111,080	10,000	.0152	.0148	
122,188	11,000	.0184	.....	
133,296	12,000	.0200	.....	
144,404	13,000	.0215	.....	
155,512	14,000	.0238	.....	
166,620	15,000	.0252	.0221	
177,728	16,000	.0269	.....	
188,836	17,000	.0288	.....	
199,944	18,000	.0303	.....	
211,052	19,000	.0320	.....	
222,160	20,000	.0340	.0296	
233,268	21,000	.0430	.....	
244,376	22,000	.0532	.....	
255,484	23,000	.0610	.....	
266,592	24,000	.0721	.....	
277,700	25,000	.0867	.0797	
288,808	26,000	.1050	.....	
299,916	27,000	.1208	.....	
311,024	28,000	.16	.....	
322,132	29,000	.17	.....	
333,240	30,000	.20	.....	
344,348	31,000	.24	.....	
355,456	32,000	.28	.....	
366,564	33,000	.32	.....	
377,672	34,000	.38	.....	
388,780	35,000	.44	.....	
399,888	36,000	.49	.....	
410,996	37,000	.57	.....	
422,104	38,000	.68	.....	
430,300	38,740	.76	.....	Tensile strength.

Sheared the rivets.
Elongation of rivet-holes, ".37 each.

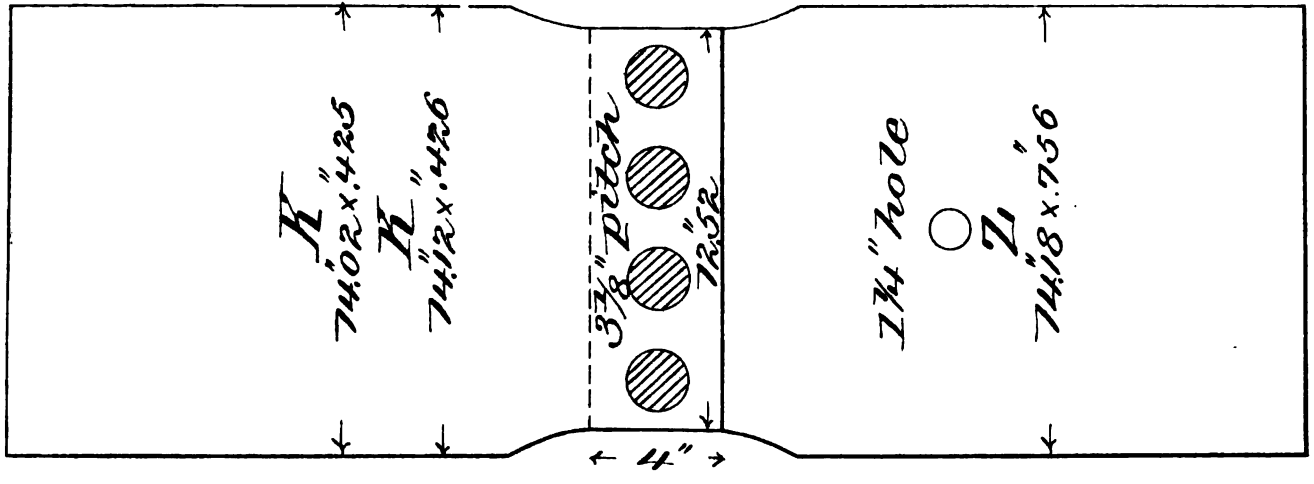
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	38,740
Tension on net section of plate	do....	66,440
Compression on bearing surface of rivets	do....	92,920
Shearing on rivets	do....	35,060

Efficiency of joint, 64.1 per cent.

No. 7518

¾" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	9.465
Plate, net sectional area	do	5.685
Plate, bearing surface of rivets	do	3.780
Rivets, shearing area	do	9.818

Applied loads.		In ganged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,465	1,000	0.	0.	Initial load.
18,930	2,000	.0067	.....	
28,395	3,000	.0085	.....	
37,860	4,000	.0062	.....	
47,325	5,000	.0083	.0072	
56,790	6,000	.0144	.....	
66,255	7,000	.0169	.....	
75,720	8,000	.0182	.....	
85,185	9,000	.0196	.....	
94,650	10,000	.0207	.0166	
104,115	11,000	.0223	.....	
113,580	12,000	.0238	.....	
123,045	13,000	.0251	.....	
132,510	14,000	.0265	.....	
141,975	15,000	.0281	.0216	
151,440	16,000	.0299	.....	
160,905	17,000	.0315	.....	
170,370	18,000	.0334	.....	
179,835	19,000	.0359	.....	
189,300	20,000	.0411	.0314	
198,765	21,000	.0486	.....	
208,230	22,000	.0600	.....	
217,695	23,000	.0785	.....	
227,160	24,000	.0984	.....	
236,625	25,000	.1180	.....	
246,090	26,000	.15	.....	
255,555	27,000	.17	.....	
265,020	28,000	.19	.....	
274,485	29,000	.22	.....	
283,950	30,000	.28	.....	
293,415	31,000	.32	.....	
302,880	32,000	.38	.....	
312,345	33,000	.43	.....	
321,810	34,000	.50	.....	
331,275	35,000	.59	.....	
340,740	36,000	.68	.....	
350,205	37,000	.80	.....	
354,500	37,500	.....	.....	Tensile strength.

Sheared the rivets.
Elongation of rivet-holes, ".49, ".47, ".47, ".47.

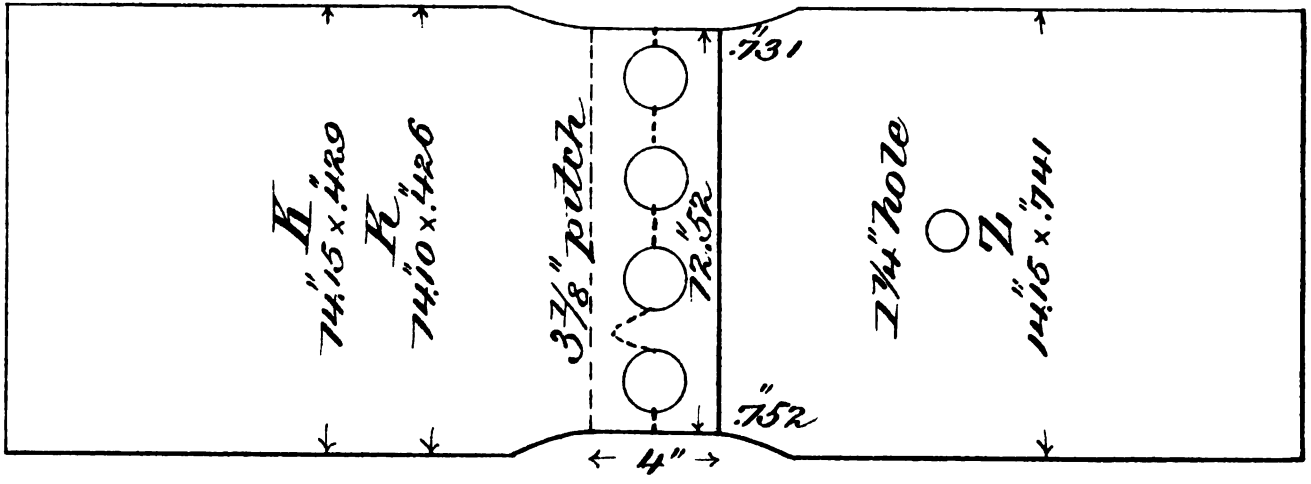
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	37,500
Tension on net section of plate	do	62,360
Compression on bearing surface of rivets	do	93,780
Shearing on rivets	do	36,110

Efficiency of joint, 63.6 per cent.

No. 7519

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	9.277
Plate, net sectional area	do	5.572
Plate, bearing surface of rivets	do	3.705
Rivets, shearing area	do	9.818

[Steel rivets.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,277	1,000	0.	0.	Initial load.
18,554	2,000	.0005	.....	
27,831	3,000	.0007	.....	
37,108	4,000	.0010	.....	
46,385	5,000	.0013	.0008	
55,662	6,000	.0021	.....	
64,939	7,000	.0043	.....	
74,216	8,000	.0051	.....	
83,493	9,000	.0059	.....	
92,770	10,000	.0084	.0068	
102,047	11,000	.0093	.....	
111,324	12,000	.0110	.....	
120,601	13,000	.0122	.....	
129,878	14,000	.0135	.....	
139,155	15,000	.0151	.0124	
148,432	16,000	.0171	.....	
157,709	17,000	.0181	.....	
166,986	18,000	.0195	.....	
176,263	19,000	.0209	.....	
185,540	20,000	.0220	.0171	
194,817	21,000	.0231	.....	
204,094	22,000	.0251	.....	
213,371	23,000	.0281	.....	
222,648	24,000	.0321	.....	
231,925	25,000	.0375	.0317	
241,202	26,000	.0531	.....	
250,479	27,000	.0654	.....	
259,756	28,000	.0814	.....	
269,033	29,000	.0961	.....	
278,310	30,000	.1116	.....	
287,587	31,000	.1323	.....	
296,864	32,000	.15	.....	
306,141	33,000	.17	.....	
315,418	34,000	.21	.....	
324,695	35,000	.25	.....	
333,972	36,000	.30	.....	
343,249	37,000	.36	.....	
352,526	38,000	.45	.....	
361,803	39,000	.60	.....	Tensile strength.

Fractured plate along line of riveting.
Near approach to tearing out plate in front of rivet at one section.
Appearance, silky, slightly lamellar.
Area at fracture (one section), 1″.64×″.48=.7872 square inch.
Contraction, 43.3 per cent.
Elongation of rivet-holes, ″.75, ″.82, ″.82, ″.68.

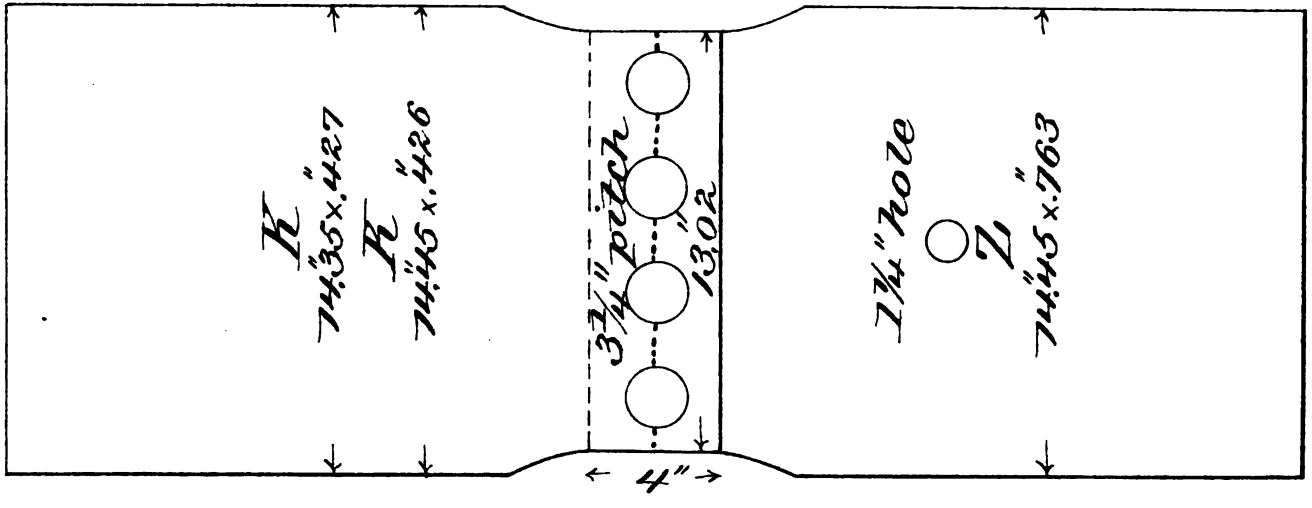
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	39,000
Tension on net section of plate	do	64,930
Compression on bearing surface of rivets	do	97,650
Shearing on rivets	do	36,850

Efficiency of joint, 66.1 per cent.

No. 7520

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches	9.934
Plate, net sectioonal area	do	6.119
Plate, bearing surface of rivets	do	3.815
Rivets, shearing area	do	9.818

[Steel rivets.]

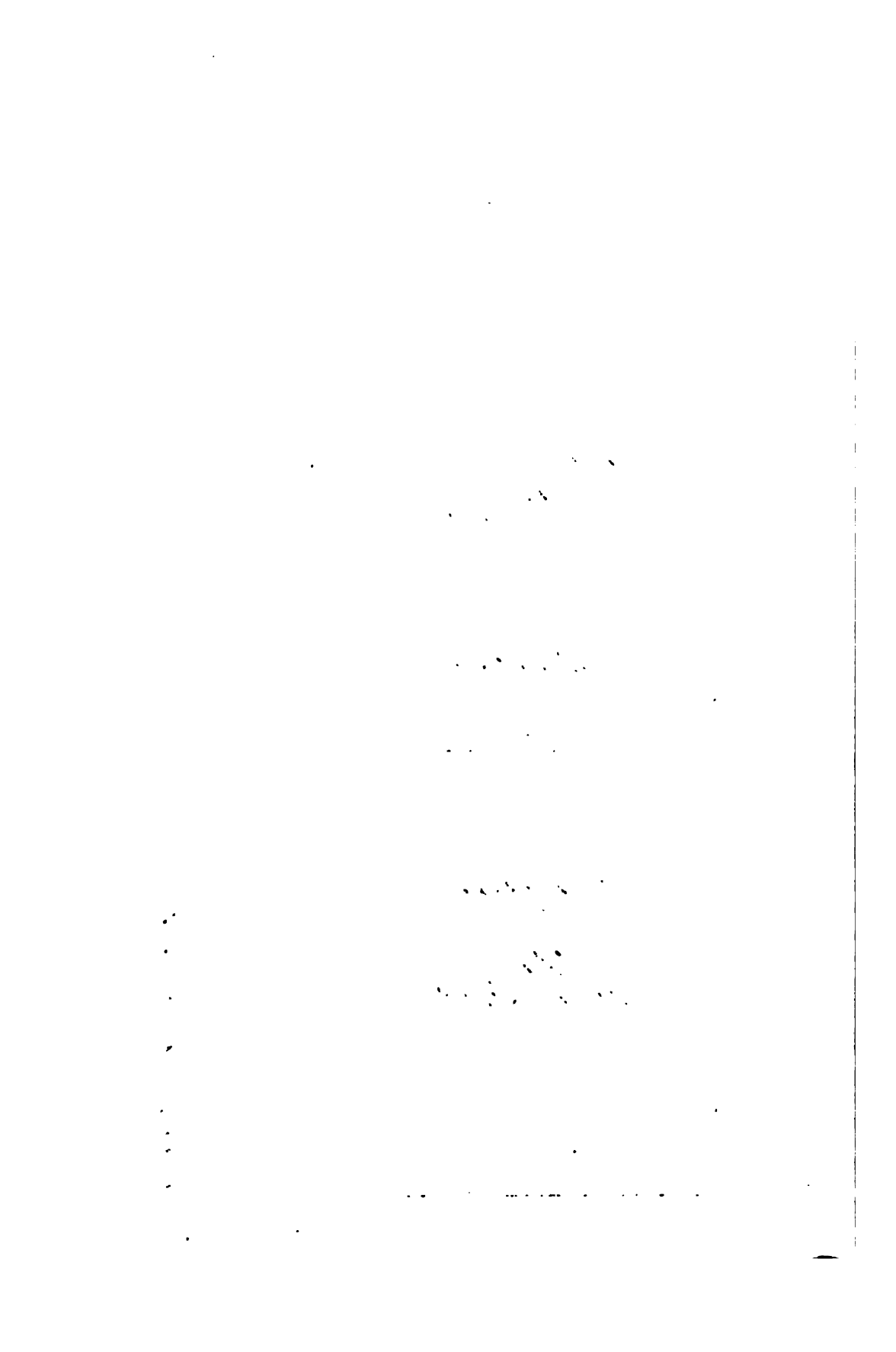
Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,934	1,000	0.	0.	Initial load.
19,868	2,000	.0000	.....	
29,802	3,000	.0004	.....	
39,736	4,000	.0007	.....	
49,670	5,000	.0016	.0013	
59,604	6,000	.0027	.....	
69,538	7,000	.0036	.....	
79,472	8,000	.0046	.....	
89,406	9,000	.0074	.....	
99,340	10,000	.0104	.0085	
109,274	11,000	.0127	.....	
119,208	12,000	.0140	.....	
129,142	13,000	.0146	.....	
139,076	14,000	.0155	.....	
149,010	15,000	.0165	.0129	
158,944	16,000	.0182	.....	
168,878	17,000	.0200	.....	
178,812	18,000	.0226	.....	
188,746	19,000	.0270	.....	
198,680	20,000	.0309	.0255	
208,614	21,000	.0354	.....	
218,548	22,000	.0435	.....	
228,482	23,000	.0550	.....	
238,416	24,000	.0695	.....	
248,350	25,000	.0828	.0749	
258,284	26,000	.0995	.....	
268,218	27,000	.1165	.....	
278,152	28,000	.1350	.....	
288,086	29,000	.16	.....	
298,020	30,000	.18	.....	
307,954	31,000	.22	.....	
317,888	32,000	.24	.....	
327,822	33,000	.29	.....	
337,756	34,000	.34	.....	
347,690	35,000	.41	.....	
357,624	36,000	.50	.....	
367,558	37,000	.65	.....	
373,500	37,600	.84	.....	Tensile strength.

Fractured plate along line of riveting.
Appearance, silky.
Area at fracture (one section), 1″.71 × ″.49 = .8379 square inch.
Contraction, 45.4 per cent.
Elongation of rivet-holes, 1″.22, 1″.05, ″.98, ″.83.

Maximum stress on joint.

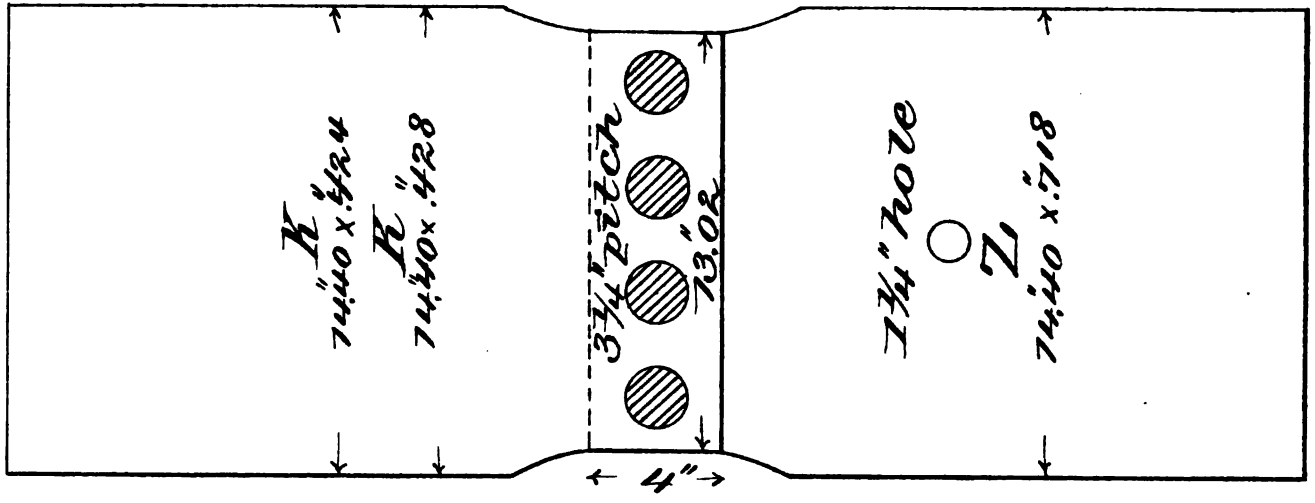
Tension on gross section of plate	pounds per square inch	37,600
Tension on net section of plate	do	61,040
Compression on bearing surface of rivets	do	97,900
Shearing on rivets	do	38,040

Efficiency of joint, 63.7 per cent.



No. 7521

3/4" steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	9.348
Plate, net sectional area	do....	5.758
Plate, bearing surface of rivets	do....	8.500
Rivets, shearing area	do....	9.818

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,348	1,000	0.	0.	Initial load.
18,696	2,000	.0005	.....	
28,044	3,000	.0020	.....	
37,392	4,000	.0039	.....	
46,740	5,000	.0097	.0093	
56,088	6,000	.0123	.....	
65,436	7,000	.0137	.....	
74,784	8,000	.0156	.....	
84,132	9,000	.0167	.....	
93,480	10,000	.0180	.0159	
102,828	11,000	.0212	.....	
112,176	12,000	.0234	.....	
121,524	13,000	.0252	.....	
130,872	14,000	.0272	.....	
140,220	15,000	.0289	.0233	
149,568	16,000	.0314	.....	
158,916	17,000	.0338	.....	
168,264	18,000	.0361	.....	
177,612	19,000	.0392	.....	
186,960	20,000	.0439	.0355	
196,308	21,000	.0542	.....	
205,656	22,000	.0662	.....	
215,004	23,000	.0862	.....	
224,352	24,000	.1069	.....	
233,700	25,000	.1266	.1154	
243,048	26,000	.15	.....	
252,396	27,000	.18	.....	
261,744	28,000	.20	.....	
271,092	29,000	.24	.....	
280,440	30,000	.27	.....	
289,788	31,000	.33	.....	
299,136	32,000	.37	.....	
308,484	33,000	.45	.....	
317,832	34,000	.53	.....	
327,180	35,000	.61	.....	
336,528	36,000	.74	.....	Tensile strength.

Sheared the rivets.
Elongation of rivet-holes, ".45, ".50, ".64, ".68.

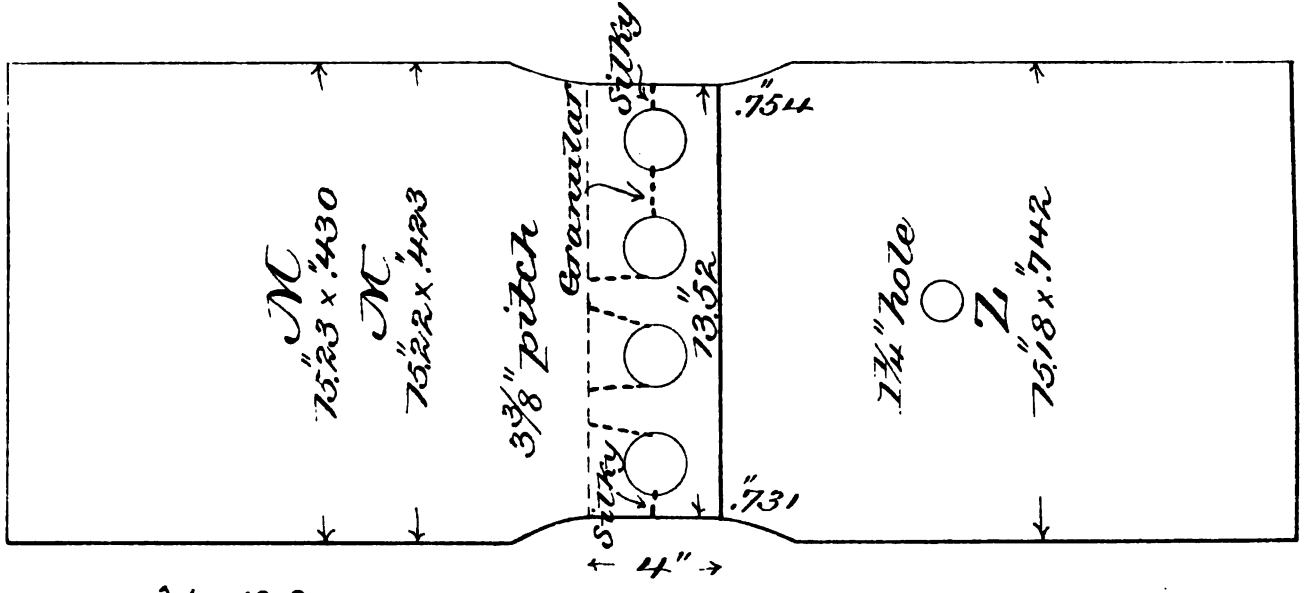
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	36,000
Tension on net section of plate	do....	58,440
Compression on bearing surface of rivets	do....	93,740
Shearing on rivets	do....	34,280

Efficiency of joint, 61.0 per cent.

No. 7522

3/4 Steel plate



H Ex 31 49 2

Areas.

Plate, gross sectional area	square inches..	10.032
Plate, net sectional area	do....	6.322
Plate, bearing surface of rivets	do....	3.710
Rivets, shearing area	do....	9.818

[Steel rivets.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,032	1,000	0.	0.	Initial load.
20,064	2,000	.0005	.....	
30,096	3,000	.0008	.....	
40,128	4,000	.0013	.....	
50,160	5,000	.0017	.0011	
60,192	6,000	.0029	.....	
70,224	7,000	.0056	.....	
80,256	8,000	.0066	.....	
90,288	9,000	.0077	.....	
100,320	10,000	.0088	.0074	
110,352	11,000	.0100	.....	
120,384	12,000	.0113	.....	
130,416	13,000	.0119	.....	
140,448	14,000	.0132	.....	
150,480	15,000	.0143	.0106	
160,512	16,000	.0163	.....	
170,544	17,000	.0186	.....	
180,576	18,000	.0206	.....	
190,608	19,000	.0228	.....	
200,640	20,000	.0256	.0196	
210,672	21,000	.0304	.....	
220,704	22,000	.0351	.....	
230,736	23,000	.0426	.....	
240,768	24,000	.0550	.....	
250,800	25,000	.0676	.0596	
260,832	26,000	.0804	.....	
270,864	27,000	.0976	.....	
280,896	28,000	.1111	.....	
290,928	29,000	.13	.....	
300,960	30,000	.16	.....	
310,992	31,000	.19	.....	
321,024	32,000	.21	.....	
331,056	33,000	.25	.....	
341,088	34,000	.28	.....	
351,120	35,000	.31	.....	
361,152	36,000	.38	.....	
371,184	37,000	.47	.....	
381,216	38,000	.53	.....	
391,248	39,000	.68	.....	
401,280	40,000	.85	.....	
401,700	40,040	.....	.....	Tensile strength

Fractured three sections, and tore out plate at two sections.

End section, silky, slightly lamellar; second section, granular, radiating from silky metal immediately at side of outside rivet-hole. This granular section fractured about $\frac{3}{4}$″ in front of center line of rivet-holes.

Elongation of rivet-holes, ″.90, ″.92, ″.98.

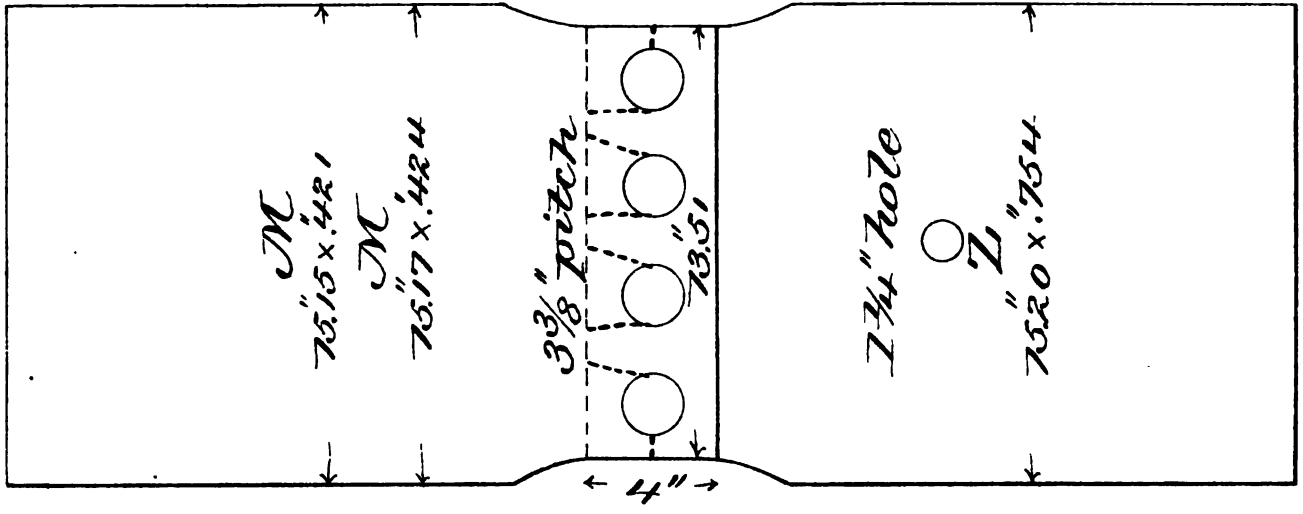
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch..	40,040
Tension on net section of plate	do....	63,540
Compression on bearing surface of rivets	do....	108,270
Shearing on rivets	do....	40,910

Efficiency of joint, 67.7 per cent.

No. 7523

¾" steel plate



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Areas.

Plate, gross sectional area	square inches	10.187
Plate, net sectional area	do	6.417
Plate, bearing surface of rivets	do	3.770
Rivets, shearing area	do	9.818

[Steel rivets.]

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,187	1,000	0.	0.	Initial load.
20,374	2,000	.0001	.....	
30,561	3,000	.0004	.....	
40,748	4,000	.0007	.....	
50,935	5,000	.0009	.0004	
61,122	6,000	.0012	.....	
71,309	7,000	.0066	.....	
81,496	8,000	.0083	.....	
91,683	9,000	.0094	.....	
101,870	10,000	.0103	.0092	
112,057	11,000	.0120	.....	
122,244	12,000	.0130	.....	
132,431	13,000	.0144	.....	
142,618	14,000	.0153	.....	
152,805	15,000	.0163	.0147	
162,992	16,000	.0173	.....	
173,179	17,000	.0188	.....	
183,366	18,000	.0208	.....	
193,553	19,000	.0235	.....	
203,740	20,000	.0261	.0222	
213,927	21,000	.0293	.....	
224,114	22,000	.0328	.....	
234,301	23,000	.0373	.....	
244,488	24,000	.0455	.....	
254,675	25,000	.0638	.0528	
264,862	26,000	.0730	.....	
275,049	27,000	.0895	.....	
285,236	28,000	.1022	.....	
295,423	29,000	.1185	.....	
305,610	30,000	.1405	.....	
315,797	31,000	.15	.....	
325,984	32,000	.18	.....	
336,171	33,000	.21	.....	
346,358	34,000	.25	.....	
356,545	35,000	.29	.....	
366,732	36,000	.36	.....	
376,919	37,000	.44	.....	
387,106	38,000	.54	.....	
397,293	39,000	.67	.....	
404,600	39,720	.85	.....	Tensile strength.

Tore out plate in front of rivet-holes.
Elongation of rivet-holes, 1″.01, ″.85, 1″.05, ″.85.

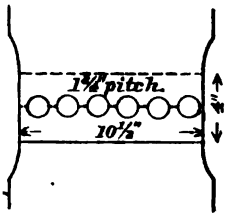
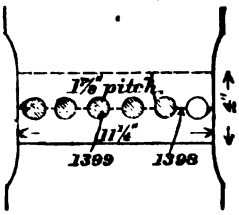
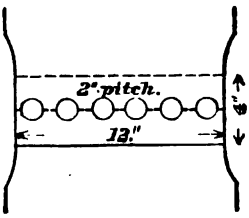
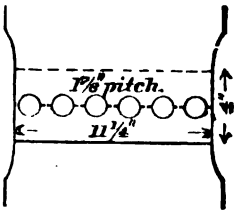
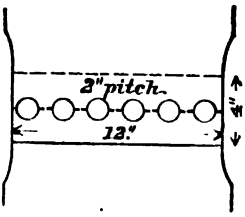
Maximum stress on joint.

Tension on gross section of plate	pounds per square inch	39,720
Tension on net section of plate	do	63,050
Compression on bearing surface of rivets	do	107,320
Shearing on rivets	do	41,210

Efficiency of joint, 67.3 per cent.

TABULATION OF SINGLE-

STEEL PLATE.

No. of test.	Sheet letters. Plate.	Covers.		Style of joint.	Nominal thickness. Plate.	Covers.	Size of rivets and holes.	Actual thickness of plate.
					Inch.	*Inch.*	*Inch.*	*Inch.*
1396	R	R	R					
1397	R	R	R					
1398	R	R	R					
1399	R	R	R					
1400	R	R	R					
1401	R	S	T					
1402	R	R	R					
1403	R	R	R					
1404	R	R	R					
1405	R	S	S					

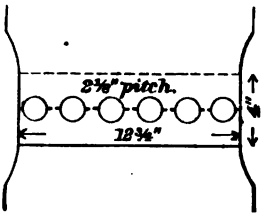
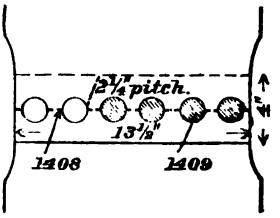
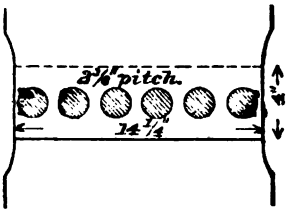
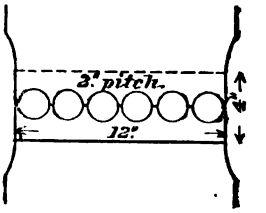
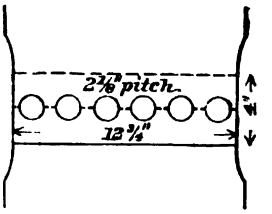
RIVETED BUTT JOINTS.

STEEL PLATE.

Sectional area of plate.		Bearing surface of rivets.	Shearing area of rivets.	Tensile strength of plate per square inch.	Maximum stress on joint per square inch.				Efficiency of joint.	Temperature of joint in degrees Fahrenheit.
Gross.	Net.				Tension on gross section of plate.	Tension on net section of plate.	Compression on bearing surface of rivets.	Shearing on rivets.		
Sq. inch.	*Sq. inch.*	*Sq. inch.*	*Sq. inch*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Per ct.*	
5.051	2.886	2.165	5.301	57,180	37,750	**66,070**	88,080	35,970	66.1	200
5.082	2.904	2.178	5.301	57,180	38,980	**68,220**	90,960	37,370	68.1	.....
5.445	3.267	2.178	5.301	57,180	45,560	**75,960**	113,960	46,820	79.6	300
5.439	3.266	2.173	5.301	57,180	39,260	**65,400**	98,290	**40,290**	68.6	.....
5.842	3.655	2.187	5.301	57,180	37,000	**59,140**	98,830	40,770	64.7	.....
5.796	3.622	2.174	5.301	57,180	39,420	**63,080**	105,100	43,100	68.9	350
5.416	2.891	2.525	7.216	57,180	36,890	**69,110**	79,130	27,690	64.5	.....
5.477	2.926	5.551	7.216	57,180	38,250	**71,600**	81,730	29,030	66.9	250
5.832	3.281	2.551	7.216	57,180	37,910	**67,380**	86,670	30,640	66.3	.....
5.854	3.297	2.557	7.216	57,180	43,730	**77,650**	100,120	35,480	76.4	300

TABULATION OF SINGLE-

STEEL PLATE—Continued.

No. of test.	Sheet letters. Plate.	Sheet letters. Covers.		Style of joint.	Nominal thickness. Plate.	Nominal thickness. Covers.	Size of rivets and holes.	Actual thickness of plate.
					Inch.	*Inch.*	*Inch.*	*Inch.*
1406	S	S	S					
1407	S	S	S					
1408	T	Q	Q					
1409	T	Q	Q					
1410	T	O	O					
1411	T	O	O					
1412	R	R	R					
1413	R	R	R					
1414	S	S	S					
1415	S	S	S					

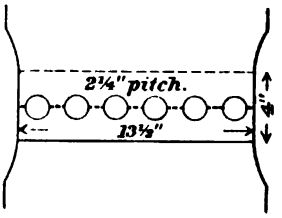
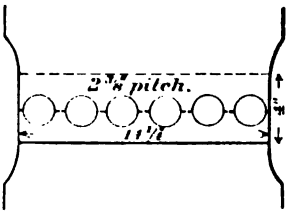
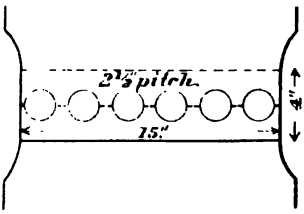
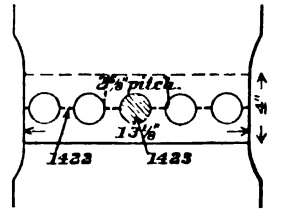
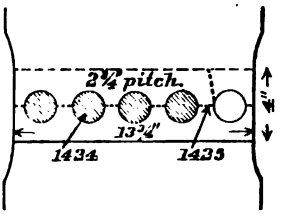
RIVETED BUTT JOINTS—Continued.

STEEL PLATE—Continued.

Sectional area of plate.		Bearing surface of rivets.	Shearing area of rivets.	Tensile strength of plate per square inch.	Maximum stress on joint per square inch:				Efficiency of joint.	Temperature of joint in degrees Fahrenheit.
Gross.	Net.				Tension on gross section of plate.	Tension on net section of plate.	Compression on bearing surface of rivets.	Shearing on rivets.		
Sq. inch.	*Sq. inch.*	*Sq. inch.*	*Sq. inch.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Per ct.*	
5.997	3.529	2.468	7.216	59,050	44,790	**76,110**	108,830	37,220	76.0	400
6.010	3.537	2.473	7.216	59,050	39,210	**66,630**	95,310	32,660	66.3	....
6.561	4.010	2.551	7.216	60,000	39,850	**65,210**	102,500	36,230	66.4	....
6.512	3.982	2.530	7.216	60,000	46,610	**76,220**	119,980	**42,060**	77.6	500
6.859	4.334	2.525	7.216	60,000	45,308	71,690	123,050	**43,060**	75.5	350
6.916	4.370	2.546	7.216	60,000	40,050	63,390	108,800	**38,530**	66.7	....
5.813	2.909	2.904	9.425	57,180	35,920	**71,770**	71,000	22,150	62.8	250
5.772	2.886	2.886	9.425	57,180	34,390	**68,780**	68,780	21,060	60.1	.....
6.023	3.191	2.832	9.425	59,050	35,000	**66,020**	74,430	22,360	59.2	.....
5.967	3.159	2.808	9.425	59,050	40,250	**76,030**	85,540	25,480	68.1	300

TABULATION OF SINGLE-

STEEL PLATE—Continued.

No. of test.	Sheet letters. Plate.	Sheet letters. Covers.		Style of joint.	Nominal thickness. Plate.	Nominal thickness. Covers.	Size of rivets and holes.	Actual thickness of plate.
					Inch.	*Inch.*	*Inch.*	*Inch.*
1416	S	Q	Q		½	5/16	15/16 and 1	.468
1417	T	Q	Q		½	5/16	15/16 and 1	.482
1418	T	O	O		½	5/16	15/16 and 1	.481
1419	T	O	O		½	5/16	15/16 and 1	.482
1420	U	P	P		½	5/16	15/16 and 1	.479
1421	U	P	P		½	5/16	15/16 and 1	.483
1422	S	S	S		½	5/16	15/16 and 1	.469
1423	S	S	S		½	5/16	15/16 and 1	.473
1424	T	O	O		½	5/16	15/16 and 1	.484
1425	T	O	O		½	5/16	15/16 and 1	.483

RIVETED BUTT JOINTS—Continued.

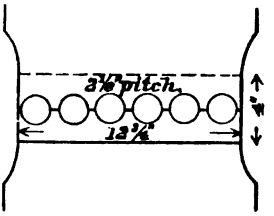
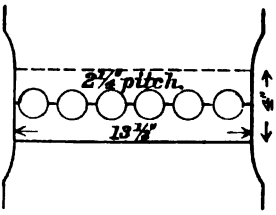
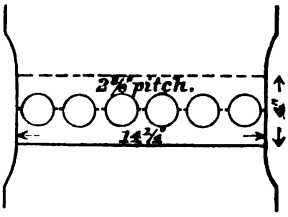
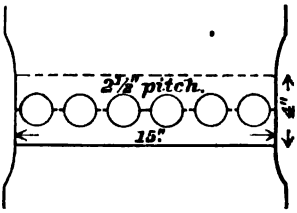
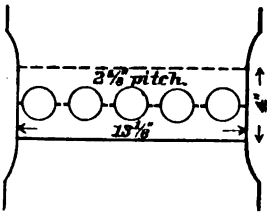
STEEL PLATE—Continued.

Sectional area of plate.		Bearing surface of rivets.	Shearing area of rivets.	Tensile strength of plate per square inch.	Maximum stress on joint per square inch.				Efficiency of joint.	Temperature of joint in degrees Fahrenheit.
Gross.	Net.				Tension on gross section of plate.	Tension on net section of plate.	Compression on bearing surface of rivets.	Shearing on rivets.		
Sq. inch.	*Sq. inch.*	*Sq. inch.*	*Sq. inch.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Per ct.*	
6.327	3.519	2.808	9.425	59,050	34,660	**62,320**	78,090	23,160	60.3	200
6.512	3.630	2.892	9.425	00,000	36,950	**66,480**	83,220	25,530	61.5	.....
6.859	3.973	2.886	9.425	60,000	43,710	**75,460**	103,880	31,810	72.8	(*)
6.883	3.991	2.892	9.425	60,000	38,720	**66,770**	92,150	28,270	64.5	.....
7.104	4.320	2.874	9.425	58,000	44,840	**74,670**	112,250	34,230	77.3	(†)
7.245	4.347	2.898	9.425	58,000	38,740	**64,570**	96,850	29,780	66.9	.....
6.167	3.822	2.345	7.854	59,050	39,730	**64,110**	104,490	31,200	67.2	.....
6.220	3.855	2.365	7.854	59,050	45,420	**73,250**	119,450	**35,840**	76.9	400
6.660	4.240	2.420	7.854	60,000	48,950	**76,890**	137,110	**41,510**	81.5	(‡)
6.632	4.217	2.415	7.854	60,000	40,600	**63,860**	111,490	34,280	67.6	.....

* Strained while at the temperature of 400° Fahr. and allowed to cool before rupture.
† Strained while at the temperature of 500° Fahr. and allowed to cool before rupture.
‡ Strained while at the temperature of 500° Fahr., then cooled to 150° Fahr. and ruptured.

TABULATION OF SINGLE

STEEL PLATE—Continued.

No. of test.	Sheet letters. Plate.	Sheet letters. Covers.		Style of joint.	Nominal thickness. Plate.	Nominal thickness. Covers.	Size of rivets and holes.	Actual thickness of plate.
					Inch.	*Inch.*	*Inch.*	*Inch.*
1426	S	S	S		¼	5/16	1 1/16 and 1 1/8	.474
1427	R	S	S		⅜	7/16	1 1/16 and 1 1/8	.475
1428	T	Q	Q		¼	5/16	1 1/16 and 1 1/8	.479
1429	S	Q	Q		⅜	7/16	1 1/16 and 1 1/8	.465
1430	U	O	O		¼	5/16	1 1/16 and 1 1/8	.484
1431	U	O	O		⅜	7/16	1 1/16 and 1 1/8	.483
1432	U	P	P		¼	5/16	1 1/16 and 1 1/8	.484
1433	U	P	P		⅜	7/16	1 1/16 and 1 1/8	.481
1434	R	S	Q		¼	5/16	1 1/16 and 1 1/8	.472
1435	S	S	S		⅜	7/16	1 1/16 and 1 1/8	.475

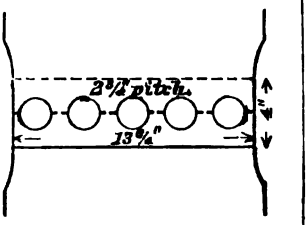
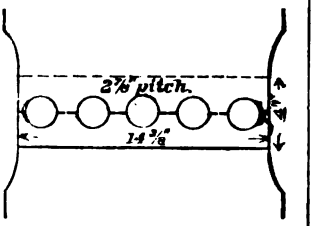
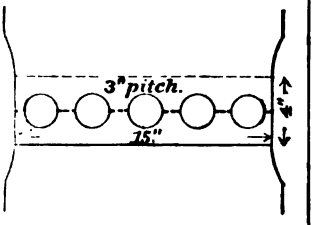
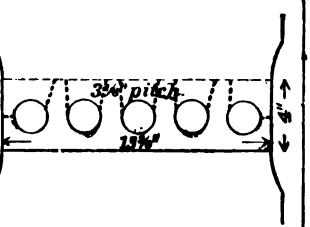
RIVETED BUTT JOINTS—Continued.

STEEL PLATE—Continued.

Sectional area of plate.		Bearing surface of rivets.	Shearing area of rivets.	Tensile strength of plate per square inch.	Maximum stress on joint per square inch.				Efficiency of joint.	Temperature of joint in degrees Fahrenheit.
Gross.	Net.				Tension on gross section of plate.	Tension on net section of plate.	Compression on bearing surface of rivets.	Shearing on rivets.		
Sq. inch.	*Sq. inch.*	*Sq. inch.*	*Sq. inch.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Per ct.*	
6.053	2.853	3.200	11.928	59,050	35,070	**74,410**	66,340	18,630	59.3	300
6.042	2.836	3.206	11.928	59,050	30,420	**64,810**	57,330	15,410	51.5	.....
6.471	3.238	3.233	11.928	60,000	40,330	**80,620**	80,730	21,880	67.2	350
6.278	3.139	3.139	11.928	59,050	33,420	**66,840**	66,840	17,590	56.5	....
6.897	3.620	3.277	11.928	58,000	36,390	**65,150**	76,590	21,040	62.7	700
6.802	3.632	3.260	11.928	58,000	33,660	**63,870**	71,160	19,450	58.0	.....
7.270	4.043	3.227	11.928	58,000	36,140	**65,000**	81,430	22,030	62.3	.....
7.215	3.968	3.247	11.928	58,000	44,490	**81,050**	99,040	26,960	76.7	500
6.193	3.538	2.655	9.940	59,050	36,670	**64,190**	85,540	22,850	62.0	.....
6.232	3.560	2.672	9.940	59,050	36,200	**63,370**	84,420	22,690	61.2	.....

TABULATION OF SINGLE-

STEEL PLATE—Continued.

No. of test.	Sheet letters. Plate.	Sheet letters. Covers.		Style of joint.	Nominal thickness. Plate.	Nominal thickness. Covers.	Size of rivets and holes.	Actual thickness of plate.
					Inch.	*Inch.*	*Inch.*	*Inch.*
1436	T	O	O		½	5/16	1 1/16 and 1⅛	.482
1437	T	O	O		½	5/16	1 1/16 and 1⅛	.482
1438	U	P	P		½	5/16	1 1/16 and 1⅛	.484
1439	U	P	P		½	5/16	1 1/16 and 1⅛	.485
1440	U	P	P		½	5/16	1 1/16 and 1⅛	.482
1441	U	P	P		½	5/16	1 1/16 and 1⅛	.483
1442	U	P	P		½	5/16	1 1/16 and 1⅛	.483
1443	U	P	P		½	5/16	1 1/16 and 1⅛	.484

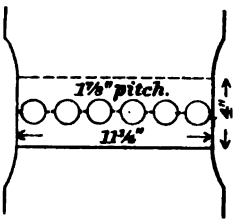
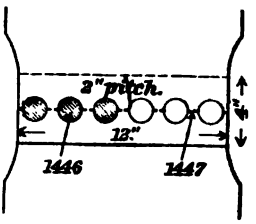
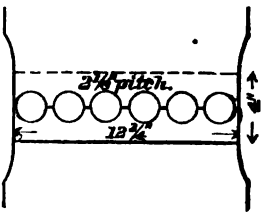
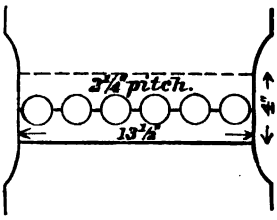
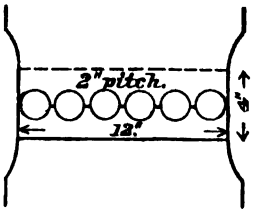
RIVETED BUTT JOINTS—Continued.

STEEL PLATE—Continued.

Sectional area of plate.		Bearing surface of rivets.	Shearing area of rivets.	Tensile strength of plate per square inch.	Maximum stress on joint per square inch.				Efficiency of joint.	Temperature of joint in degrees Fahrenheit.
Gross.	Net.				Tension on gross section of plate.	Tension on net section of plate.	Compression on bearing surface of rivets.	Shearing on rivets.		
Sq. inch.	*Sq. inch.*	*Sq. inch.*	*Sq. inch.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds*	*Pounds.*	*Per ct.*	
6.632	3.921	2.711	9.940	60,000	42,430	**71,610**	103,580	28,250	70.5	500
6.632	3.921	2.711	9.940	60,000	38,720	**65,440**	94,730	25,840	64.5	.....
6.965	4.247	2.722	9.940	58,000	46,670	**76,550**	119,320	32,680	80.3	500
6.974	4.246	2.728	9.940	58,000	38,900	**63,890**	99,440	27,290	67.0	.....
7.230	4.519	2.711	9.940	58,000	39,180	**62,690**	104,500	28,500	67.5	200
7.250	4.528	2.722	9.940	58,000	40,630	**65,060**	108,220	29,630	70.0	.....
7.564	4.837	2.717	9.940	57,410	38,570	60,450	**107,610**	29,410	67.2	.....
7.565	4.843	2.722	9.940	57,410	39,160	61,170	**108,830**	29,800	68.2	.....

TABULATION OF SINGLE-

STEEL PLATE—Continued.

No. of test.	Sheet letters. Plate.	Covers.		Style of joint.	Nominal thickness. Plate.	Covers.	Size of rivets and holes.	Actual thickness of plate.
					Inch.	*Inch.*	*Inch.*	*Inch.*
1444	V	E	E				⅞ and	.621
1445	V	B	E				⅞ and	.624
1446	V	E	E				⅞ and	.616
1447	V	E	E				⅞ and	.624
1448	V	E	E				⅞ and	.621
1449	V	E	E				⅞ and	.624
1450	W	F	G				⅞ and	.610
1451	W	G	G				⅞ and	.611
1452	V	E	E				1 and 1	.624
1453	V	E	E				1 and 1	.620

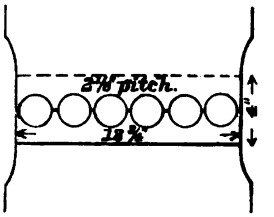
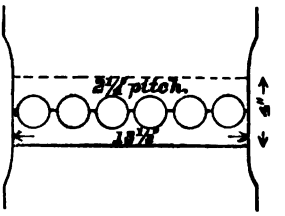
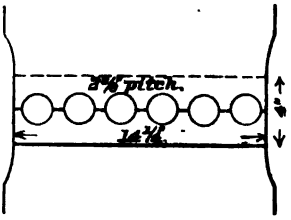
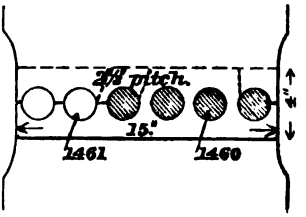
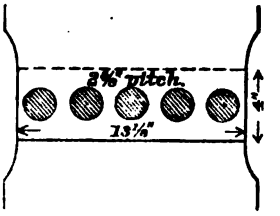
RIVETED BUTT JOINTS—Continued.

STEEL PLATE—Continued.

Sectional area of plate.		Bearing surface of rivets.	Shearing area of rivets.	Tensile strength of plate per square inch.	Maximum stress on joint per square inch.				Efficiency of joint.	Temperature of joint in degrees Fahrenheit.
Gross.	Net.				Tension on gross section of plate.	Tension on net section of plate.	Compression on bearing surface of rivets.	Shearing on rivets.		
Sq. inch.	*Sq. inch.*	*Sq. inch.*	*Sq. inch.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Per ct.*	
6.986	3.726	3.260	7.216	55,000	33,750	**63,280**	72,330	32,670	60.1	....
7.020	3.744	3.276	7.216	55,000	34,550	**64,740**	74,000	33,590	62.7	....
7.392	4.158	3.234	7.216	55,000	36,760	**65,340**	84,010	**37,650**	66.0	....
7.488	4.212	3.276	7.216	55,000	35,120	**62,440**	80,280	36,440	63.8	....
7.918	4.658	3.260	7.216	55,000	41,930	**71,270**	101,840	46,010	76.2	300
7.956	4.680	3.276	7.216	55,000	36,800	**62,560**	80,370	40,570	66.9	....
8.241	5.039	3.202	7.216	57,290	39,320	**64,290**	101,180	44,900	68.6	400
8.249	5.042	3.207	7.216	57,290	36,850	**60,290**	94,790	42,120	64.3	600
7.488	3.744	3.744	9.425	55,000	32,080	**64,150**	64,150	25,480	58.3	....
7.440	3.720	3.720	9.425	55,000	32,060	**64,110**	64,110	25,300	58.3	....

TABULATION OF SINGLE-

STEEL PLATE—Continued.

No. of test.	Sheet letters. Plate.	Sheet letters. Covers.		Style of joint.	Nominal thickness. Plate.	Nominal thickness. Covers.	Size of rivets and holes.	Actual thickness of plate.
					Inch.	*Inch.*	*Inch.*	*Inch.*
1454	V	E	E					.622
1455	V	E	E					.618
1456	W	G	F					.612
1457	W	G	G					.611
1458	W	I	I					.610
1459	W	H	H					.608
1460	X	I	I					.617
1461	X	J	I					.618
1462	V	F	F					.630
1463	W	F	F					.608

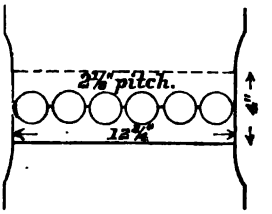
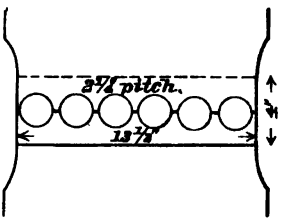
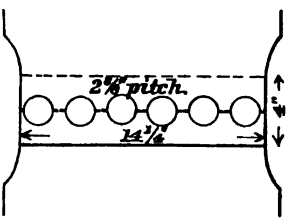
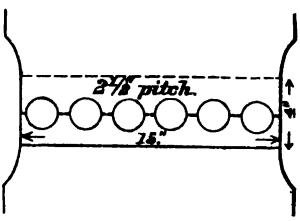
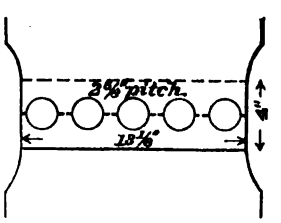
RIVETED BUTT JOINTS—Continued.

STEEL PLATE—Continued.

Sectional area of plate.		Bearing surface of rivets.	Shearing area of rivets.	Tensile strength of plate per square inch.	Maximum stress on joint per square inch.				Efficiency of joint.	Temperature of joint in degrees Fahrenheit.
Gross.	Net.				Tension on gross section of plate.	Tension on net section of plate.	Compression on bearing surface of rivets.	Shearing on rivets.		
Sq. inch.	*Sq. inch.*	*Sq. inch.*	*Sq. inch*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds*	*Per ct.*	
7.931	4.199	3.732	9.425	55,000	34,120	**64,440**	72,510	28,710	60.0	....
7.880	4.172	3.708	9.425	55,000	34,000	**64,920**	72,250	28,420	61.8	....
8.262	4.590	3.672	9.425	57,290	36,490	**65,680**	82,110	32,000	63.6	....
8.249	4.583	3.666	9.425	57,290	36,020	**64,830**	81,040	31,520	62.8	....
8.662	5.002	3.660	9.425	57,290	37,720	**65,310**	80,200	38,490	65.8	....
8.664	5.010	3.648	9.425	57,290	37,540	**64,850**	89,170	34,510	65.5	....
9.255	5.553	3.702	9.425	55,940	37,300	**62,160**	93,250	**36,630**	66.6	....
9.282	5.574	3.708	9.425	55,940	37,000	**61,610**	92,620	**36,440**	66.1	....
8.250	5.100	3.150	7.854	55,000	35,780	57,840	93,810	**37,620**	65.0	....
7.965	4.925	3.040	7.854	57,290	36,960	59,770	96,840	**37,500**	64.5	....

TABULATION OF SINGLE

STEEL PLATE—Continued.

No. of test.	Sheet letters. Plate.	Covers.		Style of joint.	Nominal thickness. Plate.	Covers.	Size of rivets and holes.	Actual thickness of plate.
					Inch.	*Inch.*	*Inch.*	*Inch.*
1464	V	E	E				1 1/16 and 1 1/8	.624
1465	V	D	E				1 1/16 and 1 1/8	.623
1466	W	G	G				1 1/16 and 1 1/8	.613
1467	W	N 1/16"	G				1 1/16 and 1 1/8	.606
1468	W	H	I				1 1/16 and 1 1/8	.613
1469	W	I	N 1/16"				1 1/16 and 1 1/8	.609
1470	X	J	I				1 1/16 and 1 1/8	.619
1471	X	J	I				1 1/16 and 1 1/8	.616
1472	V	K	.....				1 1/16 and 1 1/8	.628
1473	W	F	F				1 1/16 and 1 1/8	.609

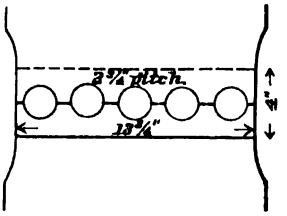
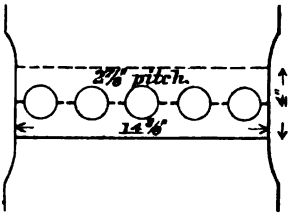
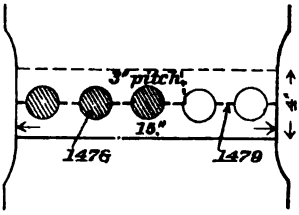
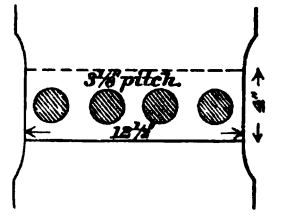
RIVETED BUTT JOINTS—Continued.

STEEL PLATE—Continued.

Sectional area of plate.		Bearing surface of rivets.	Shearing area of rivets.	Tensile strength of plate per square inch.	Maximum stress on joint per square inch.				Efficiency of joint.	Temperature of joint in degrees Fahrenheit.
Gross.	Net.				Tension on gross section of plate.	Tension on net section of plate.	Compression on bearing surface of rivets.	Shearing on rivets.		
Sq. inch.	*Sq. inch.*	*Sq. inch.*	*Sq. inch*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Per ct.*	
7.950	3.738	4.212	11.928	55,000	31,090	**66,130**	58,690	20,720	56.5	.....
7.940	3.744	4.205	11.928	55,000	31,090	**66,020**	58,780	20,720	56.5	.....
8.269	4.131	4.138	11.928	57,290	33,150	**66,350**	66,240	22,980	57.8	.....
8.181	4.090	4.091	11.928	55,940	33,240	**66,250**	66,240	22,720	58.6	.....
8.735	4.507	4.138	11.928	57,290	34,260	**65,110**	72,330	25,090	59.8	.....
8.690	4.579	4.111	11.928	57,290	34,790	**66,030**	73,540	25,350	60.7	.....
9.285	5.107	4.178	11.928	55,940	34,980	**63,600**	77,740	27,230	62.5	.....
9.240	5.082	4.158	11.928	55,940	34,770	**63,220**	77,270	26,930	62.1	.....
8.239	4.706	3.533	9.940	55,000	36,350	**63,640**	84,770	30,130	66.1	.....
7.978	4.552	3.426	9.940	57,290	37,100	**65,020**	86,400	29,780	64.7	.....

TABULATION OF SINGLE-

STEEL PLATE—Continued.

No. of test.	Sheet letters. Plate.	Sheet letters. Covers.		Style of joint.	Nominal thickness. Plate.	Nominal thickness. Covers.	Size of rivets and holes.	Actual thickness of plate.
					Inch.	*Inch.*	*Inch.*	*Inch.*
1474	W	H	D		1/4	1/4	1 1/16 and 1 1/8	.609
1475	W	G	.....		1/4	1/4	1 1/16 and 1 1/8	.610
1476	W	I	I		1/4	1/4	1 1/16 and 1 1/8	.610
1477	W	I	I		1/4	1/4	1 1/16 and 1 1/8	.609
1478	X	I	J		1/4	1/4	1 1/16 and 1 1/8	.616
1479	X	I	J		1/4	1/4	1 1/16 and 1 1/8	.623
1480	G	E	E		1/4	1/4	1 1/16 and 1 1/8	.625
1481	H	E	E		1/4	1/4	1 1/16 and 1 1/8	.621

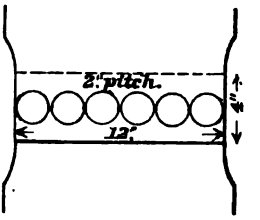
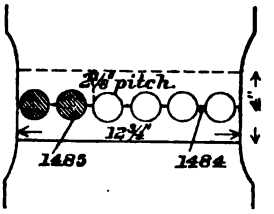
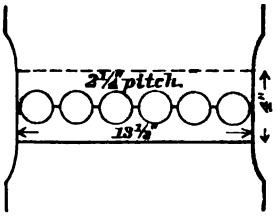
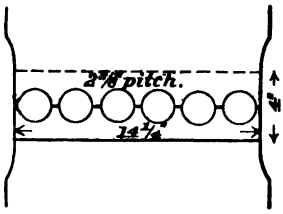
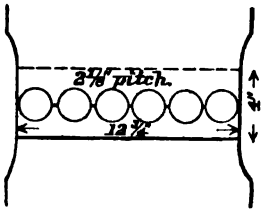
RIVETED BUTT JOINTS—Continued.

STEEL PLATE—Continued.

Sectional area of plate.		Bearing surface of rivets.	Shearing area of rivets.	Tensile strength of plate, per square inch.	Maximum stress on joint per square inch.				Efficiency of joint.	Temperature of joint in degrees Fahrenheit.
Gross.	Net.				Tension on gross section of plate.	Tension on net section of plate.	Compression on bearing surface of rivets.	Shearing on rivets.		
Sq. inch.	*Sq. inch.*	*Sq. inch.*	*Sq. inch.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Per ct.*	
8.362	4.936	3.426	9.940	57,290	38,150	**64,630**	93,110	32,090	66.5	.....
8.381	4.950	3.431	9.940	57,290	38,120	**64,540**	93,120	32,140	66.5	.....
8.833	5.402	3.431	9.940	57,290	38,620	**63,140**	99,410	34,310	67.4	.....
8.730	5.313	3.426	9.940	57,290	38,180	**62,830**	97,430	33,580	66.6	.....
9.240	5.775	3.465	9.940	55,940	38,480	**64,570**	102,630	**35,770**	68.7	.....
9.345	5.841	3.504	9.940	55,940	38,410	**64,430**	102,440	36,110	68.6	.....
7.813	5.000	2.813	7.952	55,000	37,340	58,360	103,730	**26,690**	67.9	.....
7.763	4.968	2.795	7.952	55,000	38,440	60,060	106,700	**37,530**	69.9	.....

TABULATION OF SINGLE-

STEEL PLATE—Continued.

No. of test.	Sheet letters. Plate.	Covers.		Style of joint.	Nominal thickness. Plate.	Covers.	Size of rivets and holes.	Actual thickness of plate.
					Inch.	*Inch.*	*Inch.*	*Inch.*
1482	Z	K	K				1⅛ and 1	.736
1483	Z	K	K				1⅛ and 1	.757
1484	Z	K	K				1⅛ and 1	.742
1485	Z	P	P				1⅛ and 1	.762
1486	Z	L	M				1⅛ and 1	.749
1487	Z	L	M				1⅛ and 1	.764
1488	Z	N	N				1⅛ and 1	.745
1489	Z	O	N				1⅛ and 1	.735
1490	Z	K	.....				1 1/16 and 1⅛	.723
1491	Z	P	P				1 1/16 and 1⅛	.752

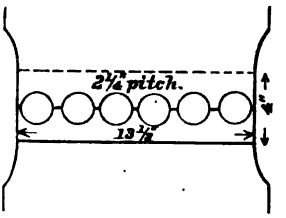
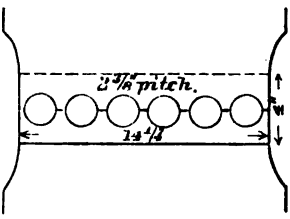
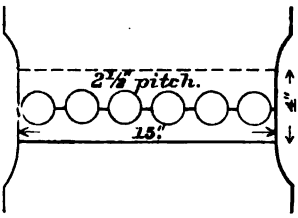
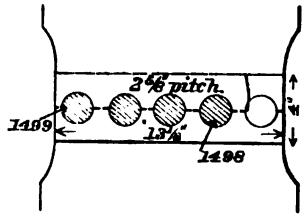
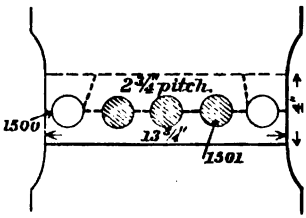
RIVETED BUTT JOINTS—Continued.

STEEL PLATE—Continued.

Sectional area of plate.		Bearing surface of rivets.	Shearing area of rivets.	Tensile strength of plate per square inch.	Maximum stress on joint per square inch.				Efficiency of joint.	Temperature of joint in degrees Fahrenheit.
Gross.	Net.				Tension on gross section of plate.	Tension on net section of plate.	Compression on bearing surface of rivets.	Shearing on rivets.		
Sq. inch.	*Sq. inch.*	*Sq. inch.*	*Sq. inch.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Per ct.*	
8.847	4.431	4.416	9.425	59,000	31,990	**63,870**	64,090	30,030	54.2	.....
9.099	4.557	4.542	9.425	59,000	31,980	**63,860**	64,070	30,870	54.2	.....
9.475	5.023	4.452	9.425	59,000	34,440	**64,960**	73,290	34,620	58.3	.....
9.723	5.151	4.572	9.425	59,000	34,700	**67,340**	73,790	**35,800**	58.8	.....
10.112	5.618	4.494	9.425	59,000	35,000	**63,000**	78,750	37,550	59.3	.....
10.329	5.745	4.584	9.425	59,000	36,780	**66,130**	82,670	40,310	62.3	.....
10.624	6.154	4.470	9.425	59,000	38,120	**65,810**	90,600	42,970	64.6	.....
10.488	6.078	4.410	9.425	59,000	34,000	**58,670**	80,860	37,830	57.6	.....
9.233	4.353	4.880	11.928	59,000	31,050	**65,860**	58,750	24,030	52.6	.....
9.596	4.520	5.076	11.928	59,000	32,000	**67,940**	65,340	25,740	54.2	.....

TABULATION OF SINGLE-

STEEL PLATE—Continued.

No. of test.	Sheet letters. Plate.	Covers.		Style of joint.	Nominal thickness. Plate.	Covers.	Size of rivets and holes.	Actual thickness of plate.
					Inch.	*Inch.*	*Inch.*	*Inch.*
1492	Z	M	L		3/8	7/16	1 1/16 and 1 1/8	.736
1493	Z	M	M		3/8	7/16	1 1/16 and 1 1/8	.754
1494	Z	N	O		3/8	7/16	1 1/16 and 1 1/8	.760
1495	Z	O	O		3/8	7/16	1 1/16 and 1 1/8	.760
1496	Y	Q	P		3/8	7/16	1 1/16 and 1 1/8	.745
1497	Y	P	P		3/8	7/16	1 1/16 and 1 1/8	.725
1498	Z	L	L		3/8	7/16	1 1/16 and 1 1/8	.733
1499	Z	L	L		3/8	7/16	1 1/16 and 1 1/8	.744
1500	Z	N	M		3/8	7/16	1 1/16 and 1 1/8	.762
1501	Z	N	N		3/8	7/16	1 1/16 and 1 1/8	.727

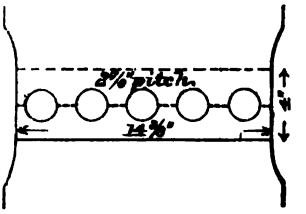
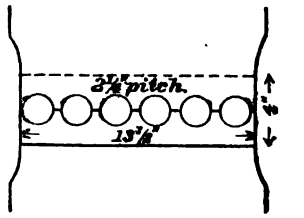
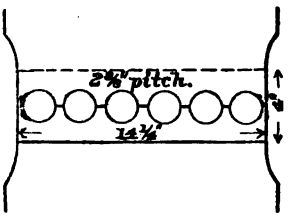
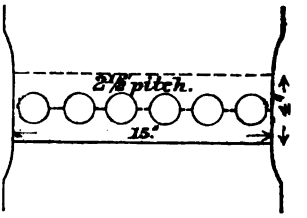
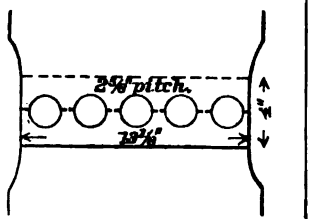
RIVETED BUTT JOINTS—Continued.

STEEL PLATE—Continued.

Sectional area of plate.		Bearing surface of rivets.	Shearing area of rivets.	Tensile strength of plate per square inch.	Maximum stress on joint per square inch.				Efficiency of joint.	Temperature of joint in degrees Fahrenheit.
Gross.	Net.				Tension on gross section of plate.	Tension on net section of plate.	Compression on bearing surface of rivets.	Shearing on rivets.		
Sq. inch.	*Sq. inch.*	*Sq. inch.*	*Sq. inch.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Per ct.*	
9.951	4.983	4.968	11.928	59,000	34,270	**68,430**	68,640	28,590	58.0	.....
10.179	5.089	5.090	11.928	59,000	33,770	**67,540**	67,520	28,810	57.2	.....
10.845	5.715	5.130	11.928	59,000	34,900	**66,230**	73,780	31,730	59.1	.....
10.838	5.708	5.130	11.928	59,000	35,810	**67,940**	75,650	32,540	60.6	.....
11.175	6.146	5.029	11.928	60,420	38,470	**69,940**	85,480	36,040	63.6	.....
10.800	5.990	4.894	11.928	60,420	37,740	**68,650**	83,980	34,460	62.4	.....
9.624	5.501	4.123	9.940	59,000	35,000	**61,230**	81,700	**33,890**	57.0	.....
9.776	5.572	4.204	10.030	59,000	36,470	**63,990**	84,810	35,550	61.7	.....
10.478	6.192	4.286	9.940	59,000	38,760	**65,590**	94,750	40,850	65.7	.....
10.004	5.915	4.069	9.940	59,000	36,740	**62,130**	89,880	**36,970**	62.2	.....

TABULATION OF SINGLE-

STEEL PLATE—Continued.

No. of test.	Sheet letters. Plate.	Sheet letters. Covers.		Style of joint.	Nominal thickness. Plate.	Nominal thickness. Covers.	Size of rivets and holes.	Actual thickness of plate
					Inch.	*Inch.*	*Inch.*	*Inch.*
1502	Z	O	P		⅝	⅞	1 1/16 and 1 1/8	.722
1503	Z	O	O		⅝	⅞	1 1/16 and 1 1/8	.741
1504	Z	M	L		⅝	⅞	1 1/16 and 1 1/8	.722
1505	Z	M	M		⅝	⅞	1 1/16 and 1 1/8	.762
1506	Y	N	O		⅝	⅞	1 1/16 and 1 1/8	.727
1507	Y	N	O		⅝	⅞	1 1/16 and 1 1/8	.735
1508	Y	O	O		⅝	⅞	1 1/16 and 1 1/8	.737
1509	Y	O	O		⅝	⅞	1 1/16 and 1 1/8	.753
1510	Y	L	L		⅝	⅞	1 1/16 and 1 1/8	.748
1511	Y	L	L		⅝	⅞	1 1/16 and 1 1/8	.755

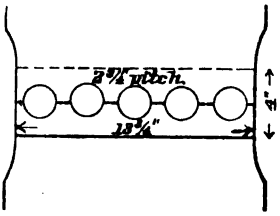
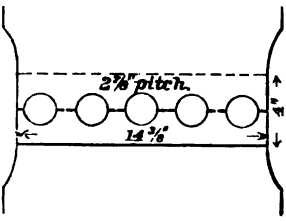
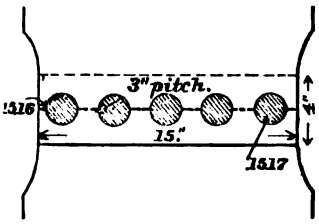
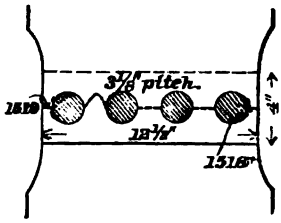
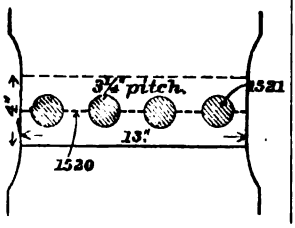
RIVETED BUTT JOINTS—Continued.

STEEL PLATE—Continued.

Sectional area of plate.		Bearing surface of rivets	Shearing area of rivets.	Tensile strength of plate per square inch.	Maximum stress on joint per square inch.				Efficiency of joint.	Temperature of joint in degrees Fahrenheit.
Gross.	Net.				Tension on gross section of plate.	Tension on net section of plate.	Compression on bearing surface of rivets.	Shearing on rivets.		
Sq. inch.	*Sq. inch.*	*Sq. inch.*	*Sq. inch.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Per ct.*	
10.390	6.329	4.061	9.940	59,000	37,930	**63,270**	97,050	39,050	64.3	.....
10.663	6.495	4.168	9.940	59,000	40,630	**65,810**	90,600	42,970	68.8	.....
9.761	4.346	5.415	14.726	59,000	29,000	**65,350**	52,460	19,280	49.3	.....
10.287	4.572	5.715	14.726	59,000	30,010	**67,520**	51,010	20,960	50.8	.....
10.367	4,914	5.453	14.726	60,420	33,610	**70,900**	63,890	23,660	55.6	.....
10.474	4.961	5.513	14.726	60,420	33,660	**71,070**	63,960	23,940	55.7	.....
11.070	5.542	5.528	14.726	60,420	34,780	**69,470**	69,650	26,140	57.5	.....
11.310	5.662	5.648	14.726	60,420	34,670	**69,250**	69,420	26,620	57.4	.....
9.918	5.243	5.675	12.272	60,420	36,120	**68,380**	76,680	29,210	59.7	.....
9.928	5.209	4.719	12.272	60,420	36,940	**70,400**	77,710	29,880	61.1	.....

TABULATION OF SINGLE-

STEEL PLATE—Continued.

No. of test.	Sheet letters. Plate.	Sheet letters. Covers.		Style of joint.	Nominal thickness. Plate.	Nominal thickness. Covers.	Size of rivets and holes.	Actual thickness of plate.
					Inch.	*Inch.*	*Inch.*	*Inch.*
1512	Z	N	N			$\frac{7}{16}$	$1\frac{3}{16}$ and $1\frac{1}{4}$	.750
1512	Z	N	N			$\frac{7}{16}$	$1\frac{3}{16}$ and $1\frac{1}{4}$	.764
1514	Y	O	O			$\frac{7}{16}$	$1\frac{3}{16}$ and $1\frac{1}{4}$	.760
1515	Y	O	O			$\frac{7}{16}$	$1\frac{3}{16}$ and $1\frac{1}{4}$	.746
1516	...	P	P			$\frac{7}{16}$	$1\frac{3}{16}$ and $1\frac{1}{4}$	.749
1517	Y	P	Q			$\frac{7}{16}$	$1\frac{3}{16}$ and $1\frac{1}{4}$	.741
1518	Z	K	K			$\frac{7}{16}$	$1\frac{3}{16}$ and $1\frac{1}{4}$	.756
1519	Z	K	K			$\frac{7}{16}$	$1\frac{3}{16}$ and $1\frac{1}{4}$	.741
1520	Z	K	K			$\frac{7}{16}$	$1\frac{3}{16}$ and $1\frac{1}{4}$	.763
1521	Z	K	K			$\frac{7}{16}$	$1\frac{3}{16}$ and $1\frac{1}{4}$	.718

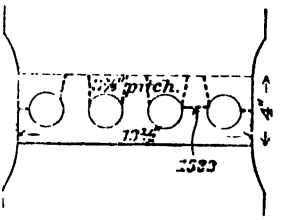
RIVETED BUTT JOINTS—Continued.

STEEL PLATE—Continued.

Sectional area of plate.		Bearing surface of rivets.	Shearing area of rivets.	Tensile strength of plate per square inch.	Maximum stress on joint per square inch.				Efficiency of joint.	Temperature of joint in degrees Fahrenheit.
Gross.	Net.				Tension on gross section of plate.	Tension on net section of plate.	Compression on bearing surface of rivets.	Shearing on rivets.		
Sq. inch.	*Sq. inch.*	*Sq. inch.*	*Sq. inch.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Per ct.*	
10.328	5.640	4.688	12.272	59,000	33,730	**61,770**	74,320	28,390	57.0	.....
10.505	5.730	4.775	12.272	59,000	35,260	**64,640**	77,570	30,100	59.7	.....
10.929	6.179	4.750	12.272	60,420	37,930	**67,080**	87,260	36,220	62.7	.....
10.735	6.072	4.663	12.272	60,420	38,720	**68,460**	89,150	33,870	64.0	.....
11.205	6.524	4.681	12.272	55,520	36,530	**62,740**	87,440	36,610	65.8	.....
11.108	6.477	4.631	12.272	60,420	38,740	66.440	92,920	**35,060**	64.1	.....
9.465	5.685	3.780	9.818	50,000	37,560	62,360	93,780	**36,110**	63.6	.....
9.277	5.572	3.705	9.818	59,000	39,000	**64,930**	97,650	36,850	66.1	.....
9.934	6.119	3.815	9.818	59,000	37,600	**61,040**	97,900	38,040	63.7	.....
9.348	5.758	3.500	9.818	59,000	36,000	58,440	93,740	**34,280**	61.0	.....

TABULATION OF SINGLE-

STEEL PLATE—Continued.

No. of test.	Sheet letters. Plate.	Sheet letters. Covers.		Style of joint.	Nominal thickness. Plate.	Nominal thickness. Covers.	Size of rivets and holes.	Actual thickness of plate.
					Inch.	*Inch.*	*Inch.*	*Inch.*
1522	Z	M	M		$\frac{3}{4}$	$\frac{7}{16}$	$1\frac{3}{16}$ and $1\frac{1}{4}$	.742
1523	Z	M	M		$\frac{3}{4}$	$\frac{7}{16}$	$1\frac{3}{16}$ and $1\frac{1}{4}$	.754

NOTE.—The figures in larger type indicate the manner of failure. When different kind of fracture

RIVETED BUTT JOINTS—Continued.

STEEL PLATE—Continued.

Sectional area of plate.		Bearing surface of rivets.	Shearing area of rivets.	Tensile strength of plate per square inch.	Maximum stress on joint per square inch.				Efficiency of joint.	Temperature of joint in degrees Fahrenheit.
Gross.	Net.				Tension on gross section of plate.	Tension on net section of plate.	Compression on bearing surface of rivets.	Shearing on rivets.		
Sq. inch.	*Sq. inch.*	*Sq. inch.*	*Sq. inch.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Per ct.*	
10.032	6.322	3.710	9.818	59,000	40,040	**63,540**	**108,270**	40,910	67.7	.....
10.187	6.417	3.770	9.818	59,000	39,720	63,050	**107,320**	41,210	67.3	.....

occurred in the same joint it is indicated by employing larger type in more than one column.

TABLE

Table of efficiencies of

STEEL PLATE

Plate.	No. of test.	Pitch of rivets.				
		1⅛"	1¼"	1⅜"	2"	2¼"
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent*
¼"	1308	67.5	68.9	72.8	.....	.....
	1313	68.3	69.9	72.1	.....	.....
	1314	.....	65.9	66.4	68.3	68.7
	1323	.....	64.9	67.1	68.6	70.3
	1324	.....	.....	62.6	64.4	67.5
	1337	.....	.....	63.9	65.9	68.2
	1338	.....	.....	.....	64.8	61.7
	1355	.....	.....	.....	58.7	60.6
⅜"	1356	74.6	**73.3**	.....	.....	.....
	1389	72.7	**72.0**	.....	.....	.....
	1360	.....	68.2	69.0	70.0	70.9
	1367	.....	68.3	70.1	70.3	**68.5**
	1368	.....	.....	64.5	61.7	64.8
	1379	.....	.....	63.0	65.2	67.4
	1380	.....	.....	.....	58.7	59.6
	1395	.....	.....	.....	57.3	59.5
½"	1396	.....	200 66.1	300 79.6	64.7	.....
	1401	.....	68.1	**68.6**	350 68.9	.....
	1402	.....	.....	64.5	66.3	400 76.0
	1411	.....	.....	250 66.9	300 76.4	66.3
	1412	.....	.....	.....	250 62.8	59.2
	1425	.....	.....	.....	60.1	300 68.1
	1426	.....	.....	.....	.....	300 59.3
	1443	.....	.....	.....	.....	51.5
⅝"	1444	.....	.....	60.1	**66.0**	300 76.2
	1451	.....	.....	62.7	63.8	**66.9**
	1452	.....	.....	.....	58.3	60.0
	1463	.....	.....	.....	58.3	61.8
	1464	.....	.....	.....	.....	56.5
	1481	.....	.....	.....	.....	56.5
¾"	1482	.....	.....	.....	54.2	58.3
	1489	.....	.....	.....	54.2	58.8
	1490	.....	.....	.....	.....	52.6
	1503	.....	.....	.....	.....	54.2
	1504	.....	.....	.....	.....	.....
	1523	.....	.....	.....	.....	.....

NOTES.—Figures in heavy-faced type denote that
Super numbers state the temperature of

No. 1.

single-riveted butt joints.

STEEL PLATE.

Pitch of rivets.										Diameter of rivet-holes.
2¼″	2⅜″	2½″	2⅝″	2¾″	2⅞″	3″	3⅛″	3¼″	3⅜″	
Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per cent.*	*Per cent.*	*Per cent.*	*Inches.*
										⅝
										⅝
72.7										⅝
74.0										⅝
70.1	70.7	76.8	69.8							⅝
70.0	72.3	67.1	68.3							⅝
61.5	63.7	72.1	65.4	77.1	73.5	73.7				1
63.4	68.4	68.5	68.4	75.0	74.1	**73.4**				1
										⅞
										⅞
										⅞
										⅞
70.7	72.4	75.5								⅞
68.2	70.4	75.6								⅞
65.4	65.3	69.8	67.4	68.8	73.2					1
64.1	68.3	69.5	68.3	69.8	75.0					1
										¾
										¾
	350									¾
66.4	**75.5**									⅞
500										
77.6	**66.7**									⅞
200	400	500		500						
60.3	72.8	77.3	67.2	81.5						1
			400							
61.5	64.5	66.9	76.9	67.6						1
350	700			600	500	200				
67.2	62.7	62.3	62.0	70.5	80.3	67.5	**67.2**			1⅛
		500								
56.5	58.0	76.7	61.2	64.5	67.0	70.0	**68.2**			1⅛
400										
68.6										⅞
600										
64.3										⅞
63.6	65.8	**66.6**	**65.0**							1
62.8	65.5	**66.1**	**64.5**							1
57.8	59.8	62.5	66.1	66.5	67.1	**68.7**	**67.9**			1⅛
58.0	60.7	62.1	64.7	66.5	66.6	68.6	**69.9**			1⅛
59.3	64.6									1
62.3	**57.6**									1
58.0	59.1	63.6	**57.0**	65.7	64.3					1⅛
57.2	60.6	62.4	61.7	**62.2**	68.8					1⅛
49.3	55.6	57.5	59.7	57.0	62.7	65.8	**63.6**	63.7	**67.7**	1¼
50.8	55.7	57.4	61.1	59.7	64.0	**64.1**	66.1	**61.0**	**67.3**	1¼

joint did not fracture along line of riveting.
joints tested at temperatures above atmospheric.

TABLE No. 2.

Table of differences between the efficiencies and ratios of net to gross areas.—single-riveted butt joints, steel plate.

Plate.	No. of test.	Width of plate between rivet-holes. 1″	1⅛″	1¼″	1⅜″	1½″	1⅝″	1¾″	1⅞″	2″	Diameter of rivet-holes.
Inch.		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*Inches.*
¼	1308	6.0	4.6	6.1	.....	.....	.....	.....	.....	.....	⅜
	1313	6.8	5.6	5.4	.....	.....	.....	.....	.....	.....	⅜
	1314	8.8	6.3	7.2	4.0	7.5	.....	.....	.....	.....	⅜
	1323	7.7	7.0	6.1	5.6	8.8	.....	.....	.....	.....	⅝
	1324	8.0	8.1	8.6	11.7	7.6	11.8	3.1	.....	.....	⅝
	1337	9.3	9.6	9.4	8.9	9.2	2.1	1.6	.....	.....	⅝
	1338	14.8	8.8	5.9	5.8	12.1	3.5	13.4	8.2	7.0	1
	1355	18.8	7.6	7.8	10.5	8.5	6.6	11.3	8.8	**6.7**	1
⅜	1356	13.1	**9.1**	.....	.....	.....	.....	.....	.....	.....	⅜
	1359	11.2	**7.7**	.....	.....	.....	.....	.....	.....	.....	⅝
	1360	11.1	9.0	7.5	6.2	.....	.....	.....	.....	.....	⅝
	1367	11.2	10.1	7.8	**3.8**	.....	.....	.....	.....	.....	⅝
	1368	11.2	5.4	5.9	9.6	9.4	10.5	.....	.....	.....	⅝
	1379	9.7	8.9	8.6	7.1	7.2	10.6	.....	.....	.....	⅝
	1380	6.8	6.7	9.9	7.4	9.8	5.5	5.2	7.9	.....	1
	1395	7.3	6.6	5.9	10.4	9.5	6.4	6.2	9.8	.....	1
½	1396	300 9.0	300 19.6	2.1	.....	.....	.....	.....	.....	.....	½
	1401	11.1	**8.6**	350 6.4	.....	.....	.....	.....	.....	.....	½
	1402	11.1	10.0	400 17.2	5.3	350 **12.3**	.....	.....	.....	.....	⅝
	1411	250 13.5	300 20.1	7.4	500 16.4	**3.5**	.....	.....	.....	.....	⅝
	1412	250 12.8	6.2	200 4.7	400 14.9	500 17.2	5.2	500 17.8	.....	.....	1
	1425	10.1	300 15.2	5.9	6.5	6.9	400 14.9	4.0	.....	.....	1
	1426	300 12.2	350 17.2	700 10.2	6.9	4.9	600 11.4	500 10.4	200 5.0	**3.2**	1⅛
	1443	4.6	6.5	5.3	500 21.7	4.1	5.4	6.1	7.5	**4.2**	1⅛
⅝	1444	6.4	**9.7**	300 17.4	400 7.5	.....	.....	.....	.....	.....	⅝
	1451	9.4	7.5	**8.1**	600 3.2	.....	.....	.....	.....	.....	⅝
	1452	8.3	7.1	8.0	8.1	**6.6**	**3.1**	.....	.....	.....	1
	1463	8.3	8.9	7.2	7.6	**6.0**	**2.7**	.....	.....	.....	1
	1464	9.5	7.8	7.2	7.5	9.0	7.5	6.2	**6.2**	**3.9**	1⅛
	1481	9.4	8.0	8.0	7.1	7.6	7.4	5.8	6.1	**5.9**	1⅛
¾	1482	4.1	5.3	**3.7**	6.7	.....	.....	.....	.....	.....	1
	1489	4.1	5.8	6.6	**—0.4**	.....	.....	.....	.....	.....	1
	1490	5.5	7.9	6.4	8.6	**—.02**	6.6	3.4	.....	.....	1¼
	1503	7.1	7.2	7.9	7.3	4.7	**3.1**	7.9	.....	.....	1¼
	1504	4.8	8.2	7.4	6.8	2.4	6.2	7.6	**3.5**	2.1	1¼
	1521	6.4	8.3	7.3	8.6	5.1	7.4	**5.8**	6.0	**—0.6**	1¼
										2½″	
										Pr. ct.	
	.....	.....	.....	.....	.....	.....	.....	.....	.....	**4.7**	
	.....	.....	.....	.....	.....	.....	.....	.....	.....	**4.3**	

NOTES.—Figures in heavy-faced type denote that joint did not fracture along line of riveting.
Super numbers state the temperature of joints tested at temperatures above atmospheric.

TABLE No. 3.

Excess in strength of net section in joint over strength of tensile test strip—single-riveted butt joints, steel plate.

Plate.	No. of test.	Width of plate between rivet-holes. 1″	1¼″	1½″	1⅝″	1¾″	1⅞″	1⅞″	1⅞″	2″	Diameter of rivet holes.
Inch.		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Inch.*
¼	1308	9.8	7.2	9.1							⅞
	1313	11.1	8.8	8.1							⅞
	1314	15.4	10.5	9.2	6.2	9.1					⅞
	1323	13.4	11.7	9.7	8.5	11.0					⅞
	1324	17.4	14.4	14.7	14.7	11.9	16.1	4.7			⅞
	1337	19.7	17.0	15.9	14.6	14.4	3.2	2.5			⅞
	1338	29.6	16.5	10.6	10.0	20.1	5.6	21.0	12.7	10.6	1
	1355	17.6	14.5	14.2	18.0	14.1	10.7	17.7	13.5	**10.1**	1
⅜	1356	21.2	**14.1**								⅞
	1359	13.1	**11.9**								⅞
	1360	19.3	15.0	12.0	9.6						⅞
	1367	19.5	16.8	12.5	**5.8**						⅞
	1368	20.9	9.7	10.1	15.6	14.9	16.1				⅞
	1379	18.2	15.9	13.5	11.7	11.4	16.5				⅞
	1380	15.5	12.6	17.8	12.8	16.3	8.9	8.2	12.2		1
	1395	14.6	12.5	10.6	17.9	15.9	10.3	9.8	15.1		1
½	1396	200 15.6	300 32.8	3.4							⅞
	1401	15.8	**14.4**	350 10.3							⅞
	1402	20.9	17.8	400 28.9	8.7	350 **19.5**					⅞
	1411	250 25.2	300 35.8	12.8	500 27.0	**5.6**					⅞
	1412	250 25.5	11.8	200 5.5	400 25.8	500 28.7	8.6	500 28.1			1
	1425	20.3	300 28.8	10.8	11.3	11.3	400 24.0	6.4			1
	1426	300 26.0	350 34.4	700 12.3	12.1	8.7	600 19.4	500 32.0	200 8.1	**5.3**	1⅛
	1443	9.8	13.2	10.1	500 39.7	7.3	9.1	10.1	12.2	**6.5**	1⅛
⅝	1444	15.1	**18.8**	300 29.6	400 12.2						⅞
	1451	17.7	13.5	**13.7**	600 5.2						⅞
	1452	16.6	17.2	14.6	14.0	**11.1**	**5.2**				1
	1463	16.6	16.8	13.2	13.2	**10.1**	**4.3**				1
	1464	20.2	15.8	13.6	13.7	15.7	12.8	10.2	**10.1**	**6.1**	1⅛
	1481	20.0	18.4	15.3	13.0	13.5	12.7	9.7	9.8	**9.2**	1⅛
¾	1482	8.3	10.1	**6.8**	11.5						1
	1489	8.2	**14.1**	12.1	**—0.6**						1
	1490	11.6	10.0	12.3	15.8	**3.8**	11.2	5.5			1⅛
	1503	15.2	14.5	15.2	13.6	8.5	**5.3**	11.5			1⅛
	1504	10.8	17.4	15.0	13.2	4.7	11.0	13.0	**5.7**	3.5	1¼
	1521	14.4	17.6	14.6	16.5	9.6	13.3	**10.0**	10.1	**—0.9**	1¼
										2⅛″	1¼
										Per ct.	1¼
										7.7	1¼
										6.9	
Average of all joints.		16.2	14.4	12.3	12.9	11.9	11.0	9.7	11.8	7.0	

NOTES.—Figures in heavy-faced type denote that joint did not fracture along line of riveting.
Super numbers state the temperature of joints tested at temperatures above atmospheric.

TABLE No. 4.

Compression on bearing surface of rivets and excess in tensile strength of net section of plate—single-riveted butt joints, steel plate.

Plate.	No. of test.	Rivet-holes.	Net width of plate.	Compression on bearing surface per square inch.	Excess tensile strength.	Plate.	No. of test.	Rivet-holes.	Net width of plate	Compression on bearing surface per square inch.	Excess tensile strength.
Inch.		*Inch.*	*Inch.*	*Pounds.*	*Per cent.*	*Inch.*		*Inch.*	*Inch.*	*Pounds.*	*Per cent.*
	1309			109, 040	11.1		1312			134, 750	9.1
	1308			108, 370	9.8		1313			133, 720	8.1
	1314			94, 890	15.4		1319			114, 750	9.7
¼	1315			93, 330	13.4	¼	1318			112, 610	9.2
	1325			84, 510	19.7		1329			103, 860	15.9
	1324			92, 870	17.4		1328			102, 810	14.7
	1339	1		72, 580	17.6		1343	1		87, 750	14.2
							1342	1		85, 130	10.6
	1356			105, 170	21.2						
	1357			102, 490	18.1		1365			112, 000	12.5
	1361			86, 430	19.5		1364			111, 510	12.0
⅜	1360			86, 330	19.3	⅜	1373			94, 580	13.5
	1368			75, 000	20.9		1372			94, 210	10.1
	1369			73, 150	18.2		1385	1		80, 570	10.6
	1380	1		69, 010	15.5		1384	1		79, 810	17.8
	1381	1		66, 880	14.6				1¼		
							1400			98, 830	3.4
	1397		1	90, 960	15.8		1407			95, 310	12.8
½	1402			79, 130	20.9	½	1417	1		83, 220	10.8
	1413	1		68, 780	20.3		1431	1		71, 160	10.1
	1427	1		57, 330	9.8						
							1456	1		82, 110	14.6
	1445			74, 000	17.7		1457	1		81, 040	13.2
	1444			72, 330	15.1	⅝	1469	1		73, 540	15.3
⅝	1452	1		64, 150	16.6		1468	1		72, 330	13.6
	1453	1		64, 110	16.6						
	1465	1		58, 780	20.0		1487	1		82, 870	12.1
	1464	1		58, 690	20.2		1495	1		75, 650	15.2
						¾	1494	1		73, 780	12.3
	1491	1		65, 340	15.2		1508	1		69, 650	15.0
	1482	1		61, 090	8.3		1509	1		69, 420	14.6
¾	1483	1		64, 070	8.2						
	1490	1		58, 750	11.6						
	1505	1		54, 010	14.4		1321			124, 880	8.5
	1504	1		52, 460	10.8		1320			122, 140	6.2
						¼	1330			110, 830	14.7
							1331			106, 620	14.6
	1311			119, 810	8.8		1345	1		96, 070	18.0
	1310			119, 180	7.2		1344	1		92, 870	10.0
	1317			103, 750	11.7						
¼	1316			102, 630	10.5		1366			116, 340	9.6
	1327			94, 480	17.0		1375			102, 360	11.7
	1326			92, 210	14.4	⅜	1374			97, 629	15.6
	1340	1		82, 150	16.5		1386	1		87, 910	12.8
	1341	1		80, 820	14.5		1387	1		87, 350	17.9
	1363			95, 130	16.8		1408		1⅛	102, 500	8.7
	1362			93, 620	15.0	⅛	1419	1		92, 150	11.3
⅜	1371			89, 000	15.9		1432	1		81, 430	12.1
	1370			84, 280	9.7						
	1382	1		75, 640	12.6		1458	1		89, 260	14.0
	1383	1	1⅛	73, 800	12.5		1459	1		89, 170	13.2
						⅝	1470	1		77, 740	13.7
	1404			86, 670	17.8		1471	1		77, 270	13.0
½	1414	1		74, 430	11.8						
	1429	1		66, 840	13.2		1488	1		90, 600	11.5
							1496	1		85, 480	15.8
	1447			80, 280	13.5	¾	1497	1		83, 980	13.6
	1454	1		72, 510	17.2		1511	1		77, 710	16.5
⅝	1455	1		72, 250	16.8		1510	1		76, 680	13.2
	1466	1		66, 240	15.8						
	1467	1		66, 240	18.4						
							1323			131, 460	11.0
	1484	1		73, 200	10.1		1322			129, 150	9.0
	1492	1		68, 640	16.0		1333			116, 076	14.4
¾	1493	1		67, 520	14.5	¼	1332		1½	113, 500	11.9
	1507	1		63, 960	17.0		1346	1		108, 960	20.1
	1506	1		63, 890	17.4		1347	1		103, 540	14.1

Compression on bearing surface of rivets, etc.—Continued.

Plate.	No. of test.	Rivet-holes.	Net width of plate.	Compression on bearing surface per square inch.	Excess tensile strength.	Plate.	No. of test.	Rivet-holes	Net width of plate.	Compression on bearing surface per square inch.	Excess tensile strength.
Inch.		*Inch.*	*Inch.*	*Pounds.*	*Per cent.*	*Inch.*		*Inch.*	*Inch.*	*Pounds.*	*Per cent.*
$\frac{5}{16}$	1377	$\frac{7}{16}$	$1\frac{1}{8}$	108,260	11.4	$\frac{3}{4}$	1500	$1\frac{1}{8}$	$1\frac{3}{4}$	94,750	11.2
	1376	$\frac{3}{8}$		105,470	14.9		1515	$1\frac{1}{4}$		89,150	13.3
	1388	1		93,710	16.3		1514	$1\frac{3}{8}$		87,260	11.0
	1389	1		93,390	15.9						
						$\frac{1}{4}$	1337	$\frac{7}{16}$	2	125,990	2.7
$\frac{1}{2}$	1421	1		96,850	11.3		1336	$\frac{3}{8}$		124,020	4.7
	1434	$1\frac{1}{8}$		85,540	8.7		1350	1		118,300	21.0
	1435	$1\frac{1}{4}$	$1\frac{1}{8}$	84,420	7.3		1351	1		114,980	17.7
$\frac{5}{8}$	1473	$1\frac{1}{8}$		86,400	13.5	$\frac{5}{16}$	1393	1		111,070	9.8
	1472	$1\frac{1}{4}$		84,770	15.7		1392	1		100,540	8.2
$\frac{3}{4}$	1499	$1\frac{1}{8}$		84,810	8.5	$\frac{1}{2}$	1425	1	$1\frac{3}{4}$	111,490	6.4
	1513	$1\frac{1}{4}$		77,570	9.6		1439	$1\frac{1}{8}$		99,450	10.1
	1512	$1\frac{3}{8}$		74,320	4.7						
						$\frac{5}{8}$	1476	$1\frac{1}{8}$		99,410	10.2
							1477	$1\frac{1}{8}$		97,430	9.7
						$\frac{3}{4}$	1502	$1\frac{1}{8}$		97,050	5.5
$\frac{1}{4}$	1334	$\frac{7}{16}$		127,550	16.1		1503	$1\frac{1}{8}$		90,600	11.5
	1335	$\frac{3}{8}$		123,030	3.2		1516	$1\frac{1}{4}$		87,440	13.0
	1340	1		112,380	10.7						
	1348	1		101,620	5.6	$\frac{1}{2}$	1353	1		126,160	13.5
							1352	1		125,220	12.7
$\frac{3}{8}$	1379	$\frac{7}{16}$	$1\frac{1}{8}$	116,280	16.5						
	1378	$\frac{3}{8}$		115,680	16.1	$\frac{5}{8}$	1395	1	$1\frac{1}{8}$	115,660	15.1
	1391	1		103,600	10.3		1394	1		113,240	12.2
	1390	1		102,340	8.9						
						$\frac{1}{2}$	1441	$1\frac{1}{8}$		108,220	12.2
$\frac{1}{2}$	1422	1		104,490	6.6		1479	$1\frac{1}{8}$		102,440	9.8
	1437	$1\frac{1}{8}$		94,730	9.1		1519	$1\frac{1}{4}$		97,650	10.1
$\frac{5}{8}$	1475	$1\frac{1}{8}$		93,120	12.7	$\frac{1}{4}$	1354	1	2	133,730	10.6
	1474	$1\frac{1}{8}$		93,110	12.8		1520	$1\frac{1}{4}$		97,900	3.5

SHEET O.—$\frac{5}{16}$″ *steel plate.*

1235						
1424	1437	1437	1436	1430	1419	1419
1429	1425	1425	1424	1411	1410	1418

a

1431	1430	1410	1240
1431	1411	1418	

SHEET P.—$\frac{5}{16}$″ *steel plate.*

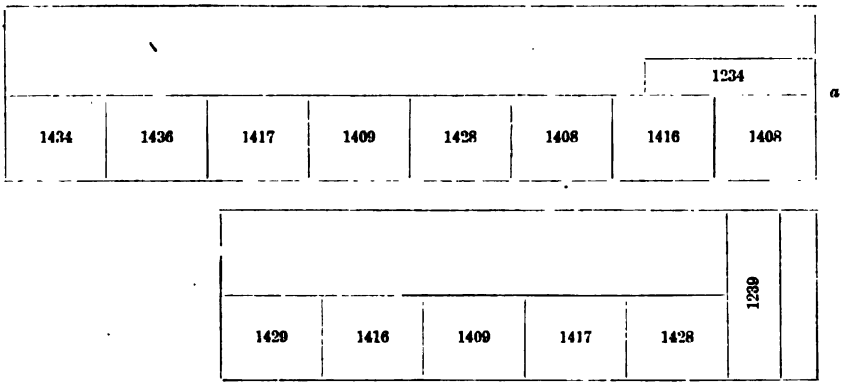
1236						
1439	1438	1441	1421	1432	1440	1420
1439	1438	1433	1420	1432	1440	1421

a

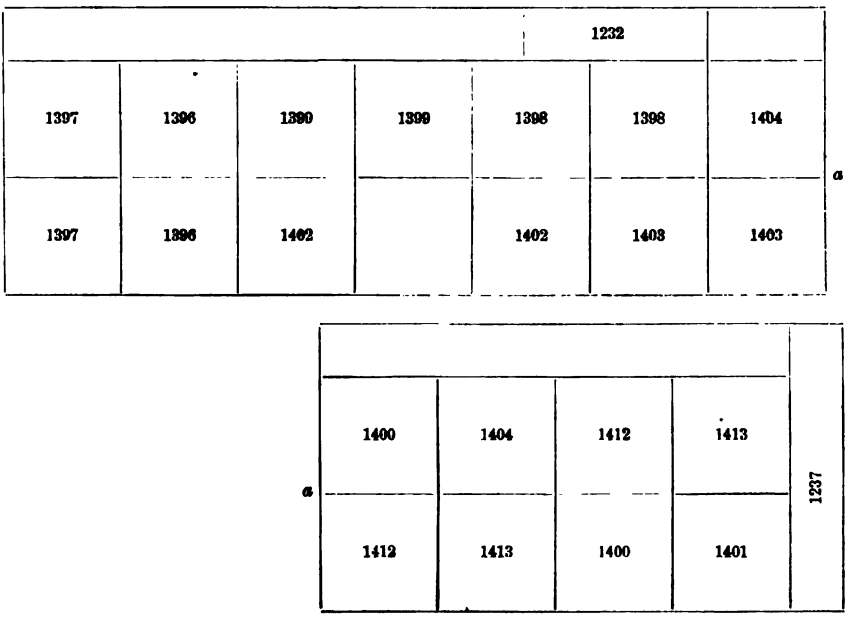
a

1441	1442	1442	1241
1433	1443	1443	

SHEET Q.—$\frac{5}{16}$″ *steel plate.*



SHEET R.—$\frac{5}{16}$″ *steel plate.*



SHEET S.—$\frac{7}{16}$″ *steel plate.*

					1233			
1401	1426	1407	1426	1414	1415	1427	1435	a
1405	1405	1406	1407	1414	1415	1427	1406	

a	1422	1434	1435	1436
	1422	1423	1423	

SHEET I.—$\frac{3}{8}$″ *steel plate.*

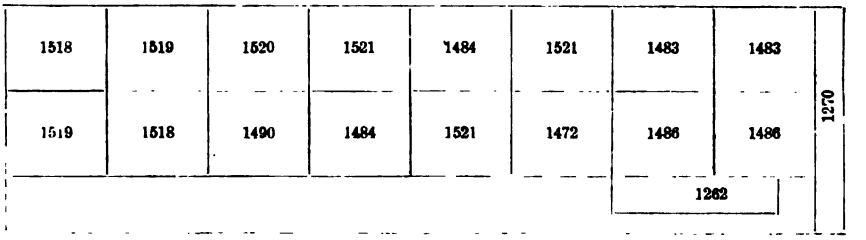
1460						1477	
					1260		a
1478	1470	1471	1479	1460	1461	1476	

	1477	1458	1469	
a				1250
	1476	1458	1468	

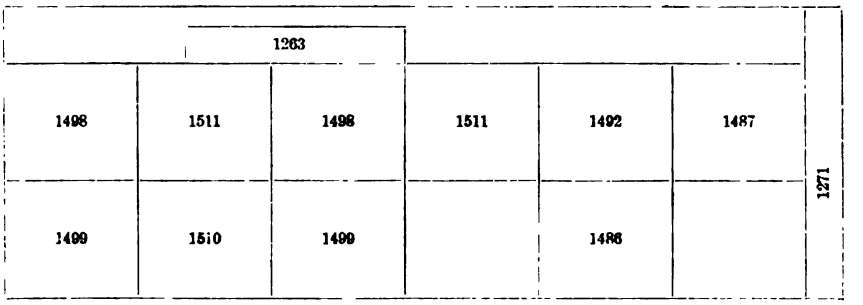
SHEET J.—$\frac{3}{8}$″ *steel plate.*

1479	1470	1261		
			1251	
1461	1471	1478		

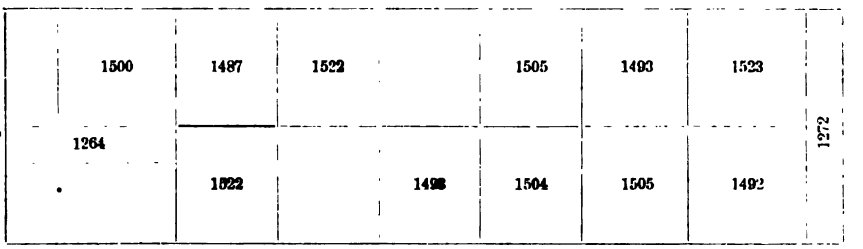
SHEET K.—$\frac{7}{16}$" *steel plate.*



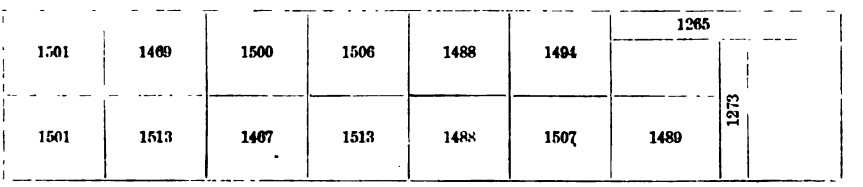
SHEET L.—$\frac{7}{16}$" *steel plate.*



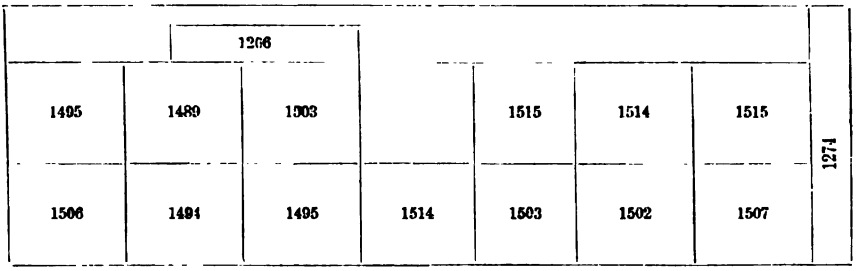
SHEET M.—$\frac{7}{16}$" *steel plate.*



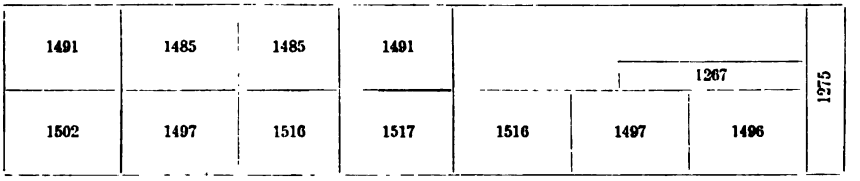
SHEET N.—$\frac{7}{16}$" *steel plate.*



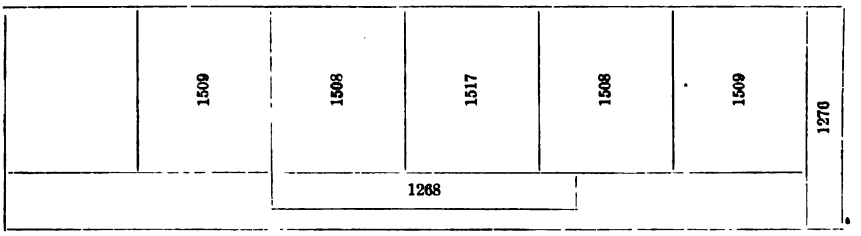
SHEET O.—$\frac{7}{16}$″ *steel plate.*



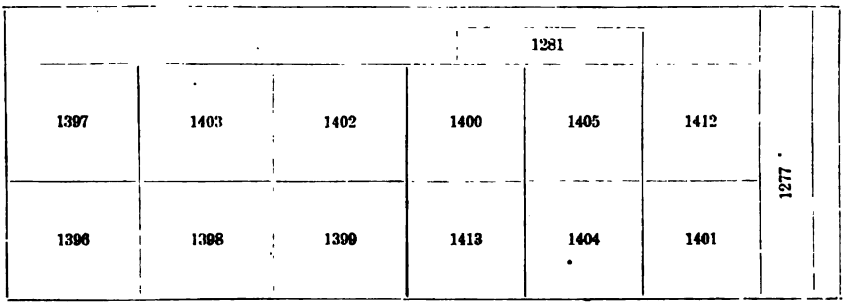
SHEET P.—$\frac{7}{16}$″ *steel plate.*



SHEET Q.—$\frac{7}{16}$″ *steel plate.*



SHEET R.—$\frac{1}{2}$″ *steel plate.*



SHEET S.—$\frac{1}{2}$″ *steel plate.*

	1282					
1406	1427	1426	1435	1420	1416	1278
1415	1414	1407	1434	1422	1429	

SHEET T.—$\frac{1}{2}$″ *steel plate.*

	1283					
1408	1417	1427	1436	1411	1419	1279
1409	1428	1425	1424	1418		

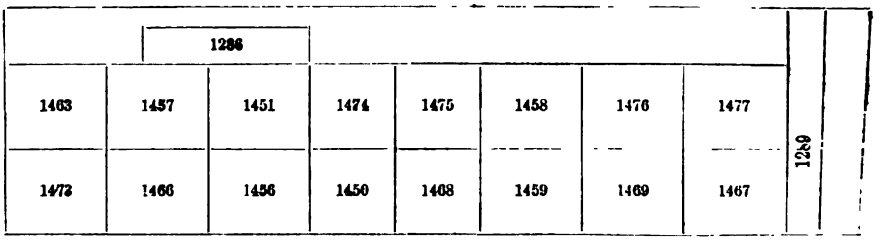
SHEET U.—$\frac{1}{2}$″ *steel plate.*

1442	1443	1441	1440	1421	1439	1438	1280
1284		1432	1420	1433	1431	1430	

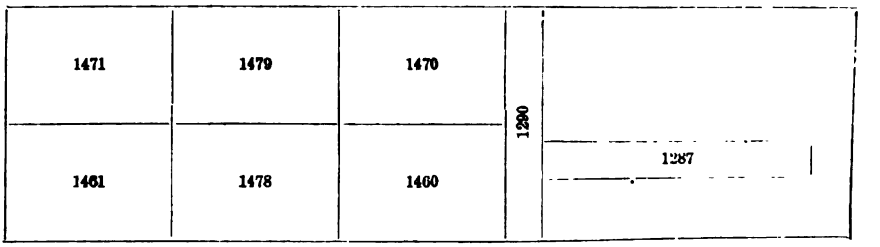
SHEET V.—$\frac{5}{8}$″ *steel plate.*

		1285						
1445	1447	1452	1481	1448	1465	1464	1462	1988
1444	1453	1446	1480	1455	1454	1449	1472	

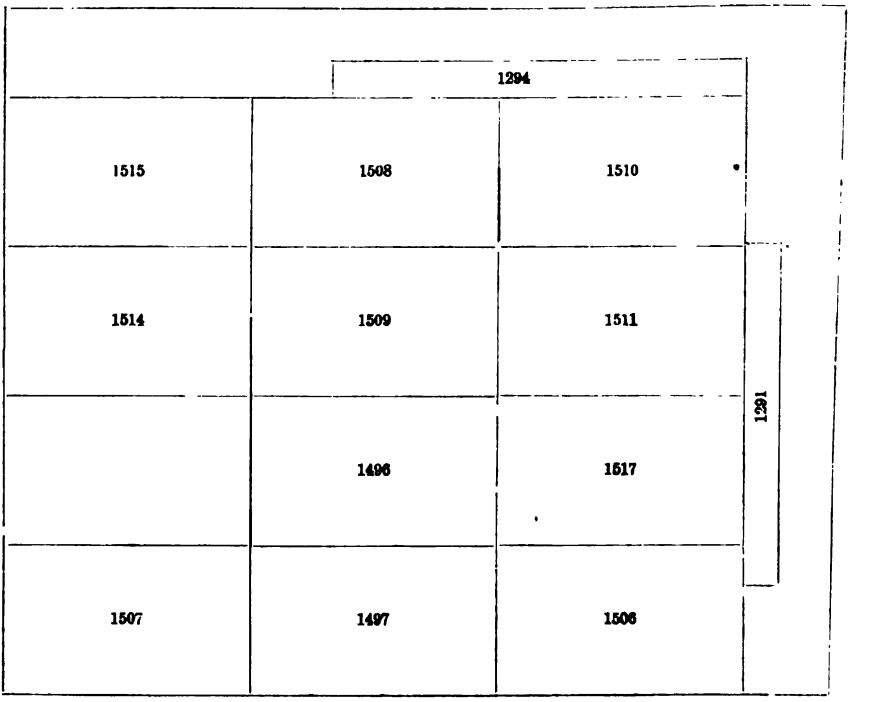
SHEET W.—$\frac{5}{8}$″ *steel plate.*



SHEET X.—$\frac{5}{8}$″ *steel plate.*



SHEET Y.—$\frac{3}{4}$″ *steel plate.*



SHEET Z.—$\frac{3}{4}$″ *steel plate.*

			1293			
1484	1498	1492	1522	1503	1489	
1570	1491		1505	1500	1495	
1485	1518	1523	1487	1513	1494	1292
1483	1519	1499	1512	1512	1488	
1482	1521	1490	1504	1501	1502	

PHOTOGRAPH OF A SHEARED RIVET.

H.Ex.31.49.2..

PHOTOGRAPH OF A SHEARED RIVET.

H.Ex.31.49.2..

PHOTOGRAPH OF PLATE FROM JOINT NO. 1481.
AFTER THE TEST.

H.Ex.31.49.2.

TENSILE TESTS

OF

STEEL AND WROUGHT-IRON EYE-BARS.

TENSILE TESTS

OF

STEEL AND WROUGHT-IRON EYE-BARS.

H. Ex. 31——99 1569

TENSILE TESTS OF STEEL AND WROUGHT-IRON EYE-BARS.

The steel eye-bars were furnished by General C. P. Stone, chief engineer for the American committee of the Statue of Liberty; the wrought-iron eye-bars by Mr. J. T. Furber, general manager of the Boston and Maine Railroad Company.

In addition to the data usually obtained from tensile tests, special attention was given to the change in the modulus of elasticity of the metal which occurs after the primitive elastic limit has been passed.

Previous observations of this nature are recorded in Report of Tests, 1883, pages 197, 200, and 207.

The modulus of elasticity under different loads, either ascending or descending, is nearly constant within the primitive elastic limit.

When a load is applied which exceeds the elastic limit sufficient to cause considerable stretch of the metal, there is a reduction in the modulus of elasticity, this property being then affected not only by loads above the primitive elastic limit but also by loads below that limit. Under ascending loads the value of the modulus of elasticity diminishes, reaching its minimum value with the last increment of load.

Under descending loads the material does not return over the same curve which the ascending loads traced, but the maximum value of the modulus of elasticity is found with the first decrement of load, the value diminishing as the loads are released. The upward and downward curves closely resemble each other, the maximum curvature being at the terminating ends, one curve being nearly the reverse of the other.

While the bar is in this state it is seen there is an apparent loss of mechanical work in stretching the metal and its recovery, represented by the area between the ascending and descending curves.

When the bar is carrying the maximum load, if the load is released a few thousand pounds and then applied again, a high value of the modulus of elasticity is obtained, both descending and ascending. If, however, the load is released to zero momentarily and quickly re-applied, the metal shows a low value of the modulus of elasticity when the higher loads are reached.

These values depend upon the total range of stresses to which the metal is subjected. The results are not materially changed if the bar sustains a high load several hours.

Allowing a short period of rest after each increment or decrement of load produces a slight addition to the elongations in the one case and to the recoveries in the other, this additional movement becoming more prominent as the range of stresses increases.

These changes in the modulus of elasticity which follow the displacement of the metal by stretching are temporary, from which the bars recover after a period of rest, the wrought-iron bars recovering a uniform modulus of elasticity sooner than the steel.

Alternate loadings by tension and compression of a section of the stem of wrought-iron eye-bar No. 767, after a long interval of rest, showed that a uniform modulus of elasticity prevailed over a range of stresses of 70,000 pounds per square inch. The deflection of the bar

under compression loads accounts for the compression measurements being less than the elongations for equal increments of load, as the micrometer was located on the convex side of the bar.

The sectional areas of the bars were first determined by calipering. After stretching they were computed on the assumption that the volumes remained constant, and that the sectional areas diminished in the same proportion as the stems elongated.

It is known, however, that the volume does not remain constant, but increases when the metal is strained beyond the elastic limit. Data are not available showing to what extent the change in specific gravity takes place, hence no correction of areas is attempted.

Specific gravity specimens taken from fractured bar No. 4137 gave the following results:

Condition of specimen.	Specimen *a*.		Specimen *b*.	
	Specific gravity.	Differences.	Specific gravity.	Differences.
As taken from fractured bar	7.8556	.....	7.8563	.....
Annealed	7.8595	.0039	7.8604	.0041
Compressed with 70,000 pounds per square inch.	7.8589	.0006	7.8561	.0043
Annealed	7.8597	.0008	7.8582	.0021
Hardened	7.8490	.0107	7.8452	.0130
Annealed	7.8581	.0091	7.8591	.0139

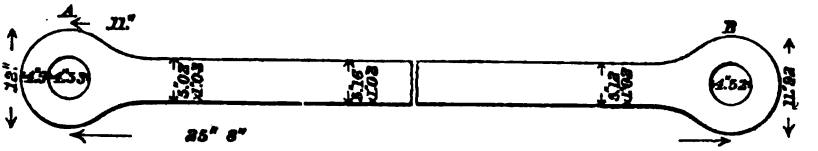
The specific gravity specimens were cylindrical, ".90 diameter by 1" long, the axis of the cylinders being at right angles to the length of the stem of the eye-bar.

The compression of the specimens after the first annealing was lengthwise the cylinders, hence at right angles to the direction of the tensile stress on the bar. The effect of tension or compression loads is to diminish the specific gravity, and annealing increases the same.

A more decided reduction in specific gravity is effected by hardening, the effects of which are again removed by annealing.

DETAILS OF TESTS OF STEEL EYE-BARS.

No. 4134.



Sectional area of stem, 5.26 square inches.
Gauged length, 260″.
Thirty 10″ sections laid off on stem of bar.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inches.*	*Inches.*	
5,260	1,000	0.	0.	0.	Initial load.
26,300	5,000	.0535	.....	.....	
52,600	10,000	.1024	.0088	.....	
78,900	15,000	.1485	.0100	.....	E = 28,953,000.
105,200	20,000	.1930	.0107	.....	E = 29,680,000.
131,500	25,000	.2405	.0140	.....	E = 29,411,000.
157,800	30,000	.2894	.0215	.....	E = 31,400,000.
170,000	.....	.3142	.....	.....	
172,000	.....	.3173	.....	.....	
174,000	.....	.3221	.....	.....	
176,000	.....	.3267	.....	.....	
178,000	.....	.3320	.....	.....	
180,000	.....	.3383	.....	.....	
182,000	34,610	.3435	.....	.....	Elastic limit.
184,100	35,000	.4025	.0890	.....	
186,000	.....	.4760	.....	.....	
188,000	.....	.5270	.....	.....	
189,360	36,000	.5890	.....	.....	
194,620	37,000	1.08	.....	.....	
199,880	38,000	2.50	2.12	.....	Stretching still in progress when load was reduced.
5,260	1,000	0.	.....	.....	
26,300	5,000	.0413	.....	.....	
52,600	10,000	.0901	.....	.....	
78,900	15,000	.1384	.....	.....	
105,200	20,000	.1880	.....	.....	
131,500	25,000	.2390	.....	.....	
157,800	30,000	.2920	.0018	.....	
		Rested under zero load 39 hours.			
5,260	1,000	0.	.....	.....	Micrometer reset.
26,300	5,000	.0415	.....	.....	
52,600	10,000	.0905	.....	.....	
78,900	15,000	.1385	.....	.....	
105,200	20,000	.1870	.....	.....	
131,500	25,000	.2380	.....	.....	
157,800	30,000	.2910	.0042	.....	
5,260	1,000	0.	.....	.....	Micrometer reset.
26,300	5,000	.0422	.....	.....	
52,600	10,000	.0905	.....	.....	
78,900	15,000	.1381	.....	.....	
105,200	20,000	.1870	.0008	.....	
		Rested 40 hours under zero load.			
199,880	38,000	2.50 2.60	.....	.....	(After 5 minutes.)
205,140	39,000	2.68	.....	.....	
210,400	40,000	2.88	.....	.....	
215,660	41,000	3.26	.....	3.85	
220,920	42,000	.....	.....	4.09	
226,180	43,000	.....	.....	4.38	
231,440	44,000	.....	.....	4.83	
236,700	45,000	.....	.....	5.33	
241,960	46,000	.....	.....	5.72	
247,220	47,000	.....	.....	6.20	
252,480	48,000	.....	.....	6.68	
257,740	49,000	.....	.....	7.13	
263,000	50,000	.....	.....	7.68	

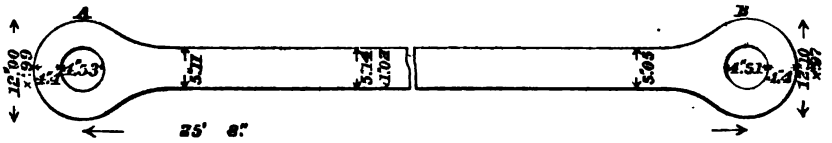
Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inches.*	*Inches.*	
268, 260	51, 000	.....	.....	8. 26	
273, 520	52, 000	.....	.....	8. 87	
278, 780	53, 000	.....	.....	9. 54	
284, 040	54, 000	.....	.....	10. 23	
289, 300	55, 000	.....	.....	10. 94	
294, 560	56, 000	.....	.....	11. 67	
299, 820	57, 000	.....	.....	12. 42	
305, 080	58, 000	.....	.....	13. 40	
310, 340	59, 000	.....	.....	14. 38	
315, 600	60, 000	.....	.....	15. 43	
320, 860	61, 000	.....	.....	16. 62	
326, 120	62, 000	.....	.....	17. 95	
331, 380	63, 000	.....	.....	19. 60	
336, 640	64, 000	.....	.....	20. 82	
341, 200	64, 870	.....	.....	23. 75	Maximum load applied.
Test discontinued, the bar at the time yielding under the maximum load.					
0	0	19. 19	.....	.....	= 7.4 per cent.
0	0	.....	.....	22. 62	= 7.3 per cent.

Elongation of 10-inch sections, ".36, ".52, ".67, ".64, ".67, ".64, ".70, ".67, ".65, ".70, ".68, ".71, ".72, ".72, ".76, ".73, ".76, ".79, ".77, ".78, ".80, ".80, ".81, ".80, ".81, ".82, ".90, ".69.

Elongation of pin-holes, A ".40, B ".63.

Metal began to thin down at sides of pin-hole B.

No. 4135.



Sectional area of stem, 5.24 square inches.

Gauged length, 260".

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inches.*	*Inches.*	
5, 240	1, 000	0.	0.	0.	Initial load.
26, 200	5, 000	.0471	.0059	.....	
52, 400	10, 000	.0959	.0081	.....	E = 27, 832, 000.
78, 600	15, 000	.1415	.0091	.....	E = 29, 147, 000.
104, 800	20, 000	.1860	.0100	.....	E = 29, 816, 000.
131, 000	25, 000	.2315	.0109	.....	E = 29, 147, 000.
157, 200	30, 000	.2780	.0130	.....	E = 29, 279, 000.
160, 000	.....	.2829	.....	.....	
162, 000	.....	.2870	.....	.....	
164, 000	.....	.2903	.....	.....	
166, 000	.....	.2940	.....	.....	
168, 000	.....	.2977	.....	.....	
170, 000	.....	.3014	.....	.....	
172, 000	.....	.3055	.....	.....	
174, 000	.....	.3090	.....	.....	
176, 000	.....	.3130	.....	.....	
178, 000	.....	.3171	.....	.....	
180, 000	.....	.3210	.....	.....	
182. 000	34, 730	.3260	.....	.....	Elastic limit.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
183,400	35,000	.3300	.0213	.....	
184,000	.....	.3335	.....	.....	
186,000	.....	.3390	.....	.....	
188,640	36,000	.3489	.....	.....	
193,880	37,000	.4140	.....	.....	
199,120	38,000	.8500	.....	.....	
204,360	39,000	2.14	.....	2.94	
209,610	40,000	.....	.....	3.10	
214,840	41,000	.....	.....	3.40	
220,080	42,000	.....	.....	3.75	
225,320	43,000	.....	.....	4.08	
230,560	44,000	.....	.....	4.46	
235,800	45,000	.....	.....	4.92	
241,040	46,000	.....	.....	5.40	
246,280	47,000	.....	.....	5.77	
251,520	48,000	.....	.....	6.23	
256,760	49,000	.....	.....	6.73	
262,000	50,000	.....	.....	7.25	
267,240	51,000	.....	.....	7.76	
272,480	52,000	.....	.....	8.31	
277,720	53,000	.....	.....	8.87	
282,960	54,000	.....	.....	9.50	
288,200	55,000	.....	.....	10.21	
293,440	56,000	.....	.....	10.90	
298,680	57,000	.....	.....	11.31	
303,920	58,000	.....	.....	12.31	
309,160	59,000	.....	.....	13.21	
314,400	60,000	.....	.....	14.21	
319,640	61,000	.....	.....	15.22	
324,880	62,000	.....	.....	16.28	
330,120	63,000	.....	.....	17.50	
335,466	64,000	.....	.....	18.86	
340,700	65,000	.....	.....	20.50	
343,700	.....	.....	.....	21.54	
0	0	.....	.....	.....	Rested 5 minutes.
345,300	.....	.....	.....	22.50	
345,600	.....	.....	.....	22.90	
345,940	66,000	.....	.....	23.25	
346,600	.....	.....	.....	23.65	
351,180	67,000	.....	.....	25.80	
363,300	69,350	.....	.....	32.70	Maximum load applied.
Test discontinued, stretching still going on without increase of load.					
0	0	27.10	.....	.....	=10.4 per cent.
0	0	.....	.....	31.60	=10.3 per cent.

Elongation of inch sections, ″.67, 1″.11, 1″.02, 1″.01, 1″, 1″.03, 1″.03, 1″.02, 1″.01, 1″.02, 1″.02, 1″.06, 1″.08, 1″.06, 1″.08, 1.″06, 1″.07. 1″.06, 1″.06, 1″.01, 1″.01, 1″.03, 1″.08, 1″.08, 1″.04, 1″.06, 1″.03, 1″.07, ″.94, ″.63.

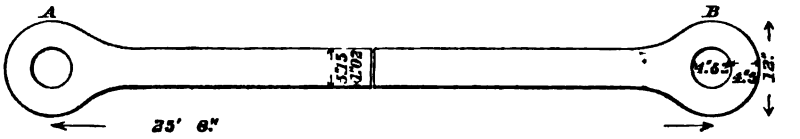
Elongation of pin-holes A ″.52, B ″.65.

After resting 8 days and 22 hours.
Gauged length, 287″.10.
Sectional area called 4.747 square inches.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
5,240	1,104	0.	0.	0.	Initial load.
26,200	5,519	.0499	.0499	.....	
52,400	11,039	.1062	.0563	.....	
78,600	16,558	.1621	.0559	.....	
104,800	22,078	.2195	.0574	.....	
131,000	27,597	.2810	.0615	.....	
157,200	33,116	.3442	.0632	.....	
183,400	38,635	.4099	.0657	.....	
209,600	44,155	.4780	.0681	.....	
235,800	49,675	.5488	.0708	.....	
262,000	55,195	.6218	.0730	.....	
235,800	49,675	.5681	.0537	.....	
209,600	44,155	.5122	.0559	.....	
183,400	38,636	.4554	.0568	.....	
157,200	33,116	.3965	.0589	.....	
131,000	27,597	.3369	.0596	.....	
104,800	22,078	.2749	.0620	.....	
78,600	16,558	.2130	.0619	.....	
52,400	11,039	.1504	.0626	.....	
26,200	5,519	.0851	.0653	.....	
5,240	1,104	.0268	.0583	.....	
		.0255	.....	.....	After 5 minutes' rest.
26,200	5,519	.0737	.0482	.....	
52,400	10,039	.1301	.0564	.....	
78,600	16,558	.1870	.0569	.....	
104,800	22,078	.2451	.0581	.....	
131,000	27,597	.3053	.0601	.....	
157,200	33,116	.3673	.0621	.....	
183,400	38,636	.4300	.0627	.....	
209,600	44,155	.4940	.0640	.....	
235,800	49,675	.5587	.0647	.....	
262,000	55,194	.6251	.0664	.....	
		.6281	.....	.....	After 3 minutes' rest.
235,800	49,675	.5731	.0450	.....	
262,000	55,194	.6290	.0559	.....	
235,800	49,675	.5745	.0545	.....	
262,000	55,194	.6300	.0555	.....	
235,800	49,675	.5751	.0549	.....	
209,600	44,155	.5190	.0561	.....	
183,400	38,636	.4619	.0571	.....	
209,600	44,155	.5169	.0550	.....	
235,800	49,675	.5728	.0559	.....	
262,000	55,194	.6302	.0574	.....	
Load released to about 10,000 pounds per square inch, then applied again; time consumed, 10 seconds.					
209,600	44,155	.5038	.....	.....	
235,800	49,675	.5661	.0623	.....	

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
262, 000	55, 194	.6297	.0636	.....	
235, 800	49, 675	.5750	.0547	.....	
262, 000	55, 194	.6304	.0554	.....	
235, 800	49, 675	.5751	.0553	.....	
209, 600	44, 155	.5192	.0550	.....	
183, 400	38, 636	.4626	.0566	.....	
157, 200	33, 116	.4032	.0594	.....	
183, 400	38, 636	.4580	.0548	.....	
209, 600	44, 155	.5139	.0559	.....	
235, 800	49, 675	.5717	.0578	.....	
262, 000	55, 194	.6306	.0589	.....	
235, 800	49, 675	.5760	.0546	.....	
209, 600	44, 155	.5200	.0560	.....	
183, 400	38, 636	.4636	.0564	.....	
157, 200	33, 116	.4047	.0589	.....	
131, 000	27, 597	.3447	.0600	.....	
157, 200	33, 116	.3985	.0538	.....	
183, 400	38, 636	.4551	.0566	.....	
209, 600	44, 155	.5126	.0575	.....	
235, 800	49, 675	.5711	.0585	.....	
262, 000	55, 194	.6311	.0600	.....	
235, 800	49, 675	.5761	.0550	.....	
262, 000	55, 194	.6319	.0558	.....	
235, 800	49, 675	.5771	.0548	.....	
209, 600	44, 155	.5210	.0561	.....	
183, 400	38, 636	.4640	.0570	.....	
157, 200	33, 116	.4044	.0596	.....	
131, 000	27, 597	.3460	.0584	.....	
104, 800	22, 078	.2842	.0618	.....	
78, 600	16, 558	.2211	.0631	.....	
52, 400	11, 039	.1589	.0622	.....	
26, 200	5, 519	.0915	.0674	.....	
5, 240	1, 104	.0389	.0526	.....	
26, 200	5, 519	.0838	.0449	.....	
52, 400	11, 039	.1399	.0561	.....	
78, 600	5, 519	.1972	.0573	.....	
104, 800	22, 078	.2550	.0578	.....	
131, 000	27, 597	.3157	.0607	.....	
157, 200	33, 116	.3769	.0612	.....	
183, 400	38, 636	.4397	.0628	.....	
209, 600	44, 155	.5017	.0620	.....	
235, 800	49, 675	.5651	.0634	.....	
262, 000	55, 194	.6300	.0649	.....	
5, 240	1, 104	.0358	.5942	.....	

No. 4136.



Sectional area of stem, 5.25 square inches.
Gauged length, 260″.
Pin-holes, ″.22 out of center line of stem.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
5,250	1,000	0.	0.	0.	Initial load.
26,250	5,000	.0456	.0065	.....	
52,500	10,000	.0915	.0085	.....	E = 29,612,000.
78,750	15,000	.1369	.0089	.....	E = 28,888,000.
105,000	20,000	.1815	.0096	.....	E = 29,682,000.
131,250	25,000	.2264	.0101	.....	E = 29,279,000.
157,500	30,000	.2720	.0109	.....	E = 29,017,000
170,000	.....	.2945	.....	.....	
172,000	.....	.2985	.....	.....	
174,000	.....	.3019	.....	.....	
176,000	.....	.3055	.....	.....	
178,000	.....	.3090	.....	.....	
180,000	.....	.3130	.....	.....	
182,000	.....	.3166	.....	.....	
183,750	.....	.3194	.0147	.....	E = 29,816,000.
186,000	.....	.3240	.....	.....	
188,000	.....	.3280	.....	.....	
190,000	.....	.3316	.....	.....	
192,000	.....	.3354	.....	.....	
194,000	.....	.3405	.....	.....	
196,000	37,330	.3459	.....	.....	Elastic limit.
198,000	.....	.3700	.....	.....	
200,000	.....	.5665	.....	.....	
204,750	39,000	1.07	.....	.....	
210,000	40,000	2.35	.....	2.76	
215,250	41,000	.....	.....	3.30	
220,500	42,000	.....	.....	3.61	
225,750	43,000	.....	.....	4.02	
231,000	44,000	.....	.....	4.44	
236,250	45,000	.....	.....	4.86	
241,500	46,000	.....	.....	5.30	
246,750	47,000	.....	.....	5.74	
252,000	48,000	.....	.....	6.18	
257,250	49,000	.....	.....	6.67	
262,500	50,000	.....	.....	7.15	
267,750	51,000	.....	.....	7.65	
273,000	52,000	.....	.....	8.20	
278,250	53,000	.....	.....	8.78	
283,500	54,000	.....	.....	9.42	
288,750	55,000	.....	.....	10.05	
294,000	56,000	.....	.....	10.70	
299,250	57,000	.....	.....	11.41	
304,500	58,000	.....	.....	12.17	
309,750	59,000	.....	.....	13.07	
315,000	60,000	.....	.....	13.90	
320,250	61,000	.....	.....	14.83	
325,500	62,000	.....	.....	15.80	
330,750	63,000	.....	.....	17.00	
336,000	64,000	.....	.....	18.35	
341,250	65,000	.....	.....	19.83	
345,200	.....	.....	.....	21.05	
0	0	.....	.....	.....	Rested 5 minutes.
346,500	.....	.....	.....	21.35	
351,750	.....	.....	.....	23.70	
357,000	.....	.....	.....	26.05	
361,400	.....	.....	.....	28.80	
362,000	.....	.....	.....	29.30	
362,250	.....	.....	.....	29.70	

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
364,000	.....	.....	.....	30.70	
365,400	.....	.....	.....	31.90	
366,000	.....	.....	.....	32.80	
366,100	.....	.....	.....	33.00	
366,400	.....	.....	.....	33.60	
367,300	.....	.....	.....	34.20	
				34.40	
367,500	.....	.....	.....	34.80	
				35.00	
367,700	.....	.....	.....	35.65	
368,800	.....	.....	.....	36.20	
369,000	70,286	.....	.....	36.60	Maximum load reached.
0	0	30.42	.....	.....	—11.7 per cent.
0	0	.....	.....	35.48	—11.5 per cent.

Elongation of 10-inch sections, ".57, 1".16, 1".22, 1".18, 1".19, 1".18, 1".16, 1".20, 1".13, 1".17, 1".13, 1".17, 1".23, 1".19, 1".17, 1".16, 1".20, 1".17, 1".17, 1".14, 1".13, 1".20, 1".11, 1".17, 1".17, 1".15, 1".17, 1".16, 1".26, ".88.

Elongation of pin-holes, A ".51, B ".66.

Elongations now measured in 290".42.

Sectional area called 4.70 square inches.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
5,500	1,117	0.	0.	0.	Micrometer reset.
26,250	5,585	.0495	.....	.....	
52,500	11,170	.1087	.....	.....	
78,750	16,755	.1682	.....	.....	
105,000	22,340	.2294	.....	.....	
131,250	27,925	.2923	.....	.....	
157,500	33,510	.3577	.....	.....	
183,750	39,095	.4236	.....	.....	
210,000	44,680	.4908	.....	.....	
236,250	50,265	.5595	.....	.....	
262,500	55,850	.6310	—.0010	.....	
10,000	.....	.....	.....	.....	Rested 1 hour.
5,250	1,117	.....	—.0150	.....	
5,250	1,117	0.	0.	0.	Micrometer reset.
26,250	5,585	.0500	.....	.....	
52,500	11,170	.1090	.....	.....	
78,750	16,755	.1675	.....	.....	
105,000	22,340	.2292	.....	.....	
131,250	27,925	.2926	.....	.....	
157,500	33,510	.3570	.....	.....	
183,750	39,095	.4227	.....	.....	
210,000	44,680	.4894	.....	.....	
236,250	50,265	.5566	.....	.....	
			.0028	.....	Immediate set.
262,500	55,850	.6203	.0005	.....	Set after 10 minutes.
			.0000	.....	Set after 12 minutes.

Applied loads		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
5,250	1,117	0.	0.	.....	
26,250	5,585	.0503	.0503	.....	
52,500	11,170	.1004	.0501	.....	E=27,444,000.
78,750	16,755	.1685	.0501	.....	Rested 15 minutes under load.
105,000	22,340	.2294	.0609	.....	E=26,633,000.
131,250	27,925	.2915	.0621	.....	E=26,119,000.
157,500	33,510	.3571	.0656	.....	E=24,725,000.
183,750	39,095	.4214	.0643	.....	E=25,225,000.
210,000	44,680	.4883	.0669	.....	E=24,245,000.
236,250	50,265	.5537	.0654	.....	E=24,801,000.
262,500	55,850	.6220	.0683	.....	E=23,748,000.
288,750	61,435	.6949	.0729	.....	E=22,249,000.
315,000	67,020	.7744	.0795	.....	E=20,402,000.
341,250	72,605	.8660	.0916	.....	E=17,707,000.
341,250	72,605	.8750	.....	.....	
315,000	67,020	.8190	.0560	.....	E=28,964,000.
288,750	61,435	.7605	.0585	.....	E=27,726,000.
262,500	55,850	.7005	.0600	.....	E=27,033,000.
236,250	50,265	.6400	.0605	.....	E=26,809,000.
210,000	44,680	.5770	.0630	.....	E=25,745,000.
183,750	39,095	.5130	.0640	.....	E=25,343,000.
157,500	33,510	.4470	.0660	.....	E=24,575,000.
131,250	27,925	.3813	.0657	.....	E=24,687,000.
105,000	22,340	.3135	.0678	.....	E=23,923,000.
78,750	16,755	.2440	.0695	.....	E=23,338,000.
52,500	11,170	.1715	.0725	.....	E=22,372,000.
26,250	5,585	.0957	.0758	.....	E=21,398,000.
5,250	1,117	.0301	.0656	.....	Immediate set.
		.0215	.0086	.....	Set after 20 minutes.
5,250	1,117	0.	0.	.....	Micrometer reset.
26,250	5,585	.0500	.0500	.....	
52,500	11,170	.1091	.0591	.....	
78,750	16,755	.1690	.0599	.....	
105,000	22,340	.2302	.0612	.....	
131,250	27,925	.2940	.0638	.....	
157,500	33,510	.3580	.0640	.....	
183,750	39,095	.4231	.0651	.....	
210,000	44,680	.4899	.0668	.....	
236,250	50,265	.5555	.0656	.....	
262,500	55,850	.6257	.0702	.....	
236,250	50,265	.5691	.0566	.....	
210,000	44,680	.5115	.0576	.....	
183,750	39,095	.4520	.0595	.....	
157,500	33,510	.3907	.0613	.....	
131,250	27,925	.3285	.0622	.....	
105,000	22,340	.2650	.0635	.....	
78,750	16,755	.2000	.0650	.....	
52,500	11,170	.1340	.0660	.....	
26,250	5,585	.0650	.0690	.....	
5,250	1,117	.0041	.0009	.....	Immediate set.
		.0012	.0029	.....	Set after 6 minutes.
5,250	1,117	0.	.....	.....	Micrometer reset.

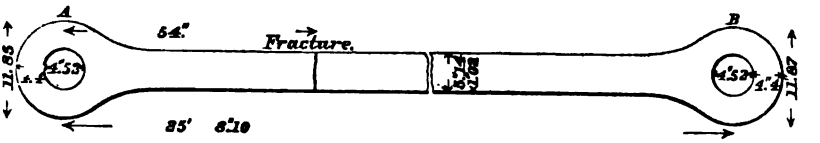
Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
26, 250	5, 585	.0503	.0503	.....	Immediate elongation.
		.0504	.....	.....	After 3 minutes.
52, 500	11, 170	.1093	.0590	.....	
		.0999	.....	.....	Do.
78, 750	16, 755	.1685	.0592	.....	
		.1690	.....	.....	Do.
105, 000	22, 340	.2299	.0614	.....	
		.2309	.....	.....	Do.
131, 250	27, 925	.2922	.0623	.....	
		.2935	.....	.....	Do.
157, 500	33, 510	.3562	.0640	.....	
		.3575	.....	.....	Do.
183, 750	39, 095	.4209	.0647	.....	
		.4222	.....	.....	Do.
210, 000	44, 680	.4868	.0659	.....	
		.4885	.....	.....	Do.
236, 250	50, 265	.5533	.0665	.....	
		.5549	.....	.....	Do.
262, 500	55, 850	.6209	.0676	.....	
		.6230	.....	.....	Do.
236, 250	50, 265	.5660	.0549	.....	Immediate recovery.
		.5659	.....	.....	After 3 minutes.
210, 000	44, 680	.5082	.0578	.....	
		.5080	.....	.....	Do.
183, 750	39, 095	.4491	.0591	.....	
		.4489	.....	.....	Do.
157, 500	33, 510	.3856	.0005	.....	
		.3880	.....	.....	Do.
131, 250	27, 925	.3202	.0624	.....	
		.3252	.....	.....	Do.
105, 000	22, 340	.2631	.0631	.....	
		.2620	.....	.....	Do.
78, 750	16, 755	.1980	.0651	.....	
		.1971	.....	.....	Do.
52, 500	11, 170	.1331	.0649	.....	
		.1319	.....	.....	Do.
26, 250	5, 585	.0655	0.676	.....	
		.0627	.....	.....	Do.
5, 250	1, 117	.0048	0.607	.....	
		.0030	.....	.....	Do.
Bar rested under initial load 15 hours.					
5, 250	.....	−.0054	.....	.....	Set found after resting, *i. e.*, total recovery = ″.0018 + ″.0054 = ″.0072.
5, 250	1, 117	0.	.....	.....	Micrometer reset.
26, 250	5, 585	.0504	.0504	.....	
52, 500	11, 170	.1084	.0580	.....	
78, 750	16, 755	.1660	.0576	.....	
105, 000	22, 340	.2250	.0590	.....	
131, 250	27, 925	.2870	.0620	.....	
157, 500	33, 510	.3510	.0640	.....	

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
183, 750	39, 095	.4157	.0647	.....	
210, 000	44, 680	.4839	.0682	.....	
236, 250	50, 265	.5493	.0654	.....	
262, 500	55, 850	.6180	.0687	.....	
236, 250	50, 265	.5621	.0559	.....	
210, 000	44, 680	.5017	.0574	.....	
183, 750	39, 095	.4459	.0588	.....	
157, 500	33, 510	.3857	.0602	.....	
131, 250	27, 925	.3241	.0616	.....	
105, 000	22, 340	.2609	.0632	.....	
78, 750	16, 755	.1970	.0639	.....	
52, 500	11, 170	.1321	.0649	.....	
26, 250	5, 585	.0644	.0677	.....	
5, 250	1, 117	.0065	.0579	.....	Test discontinued.
After a further rest of 25 hours the bar placed in the testing-machine and loaded as follows:					
5, 250	1, 117	0.	.....	.....	Initial load.
26, 250	5, 585	.0501	.0501	.....	
52, 500	11, 170	.1080	.0579	.....	
78, 750	16, 755	.1652	.0572	.....	
105, 000	22, 340	.2246	.0594	.....	
131, 250	27, 925	.2861	.0615	.....	
157, 500	33, 510	.3504	.0643	.....	
183, 750	39, 095	.4151	.0647	.....	
210, 000	44, 680	.4821	.0670	.....	
236, 250	50, 265	.5499	.0678	.....	
262, 500	55, 850	.6191	.0692	.....	
236, 250	50, 265	.5641	.0550	.....	
210, 000	44, 680	.5067	.0574	.....	
183, 750	39, 095	.4481	.0586	.....	
157, 500	33, 510	.3881	.0600	.....	
131, 250	27, 925	.3266	.0615	.....	
105, 000	22, 340	.2634	.0632	.....	
78, 750	16, 755	.2000	.0634	.....	
52, 500	11, 170	.1364	.0636	.....	
26, 250	5, 585	.0696	.0668	.....	
5, 250	1, 117	.0119	.0577	.....	
262, 500	55, 850	.6205	.6086	.....	
5, 250	1, 117	.0130	.6075	.....	Test discontinued.
After a further rest of 24 hours and 20 minutes the bar again placed in the testing-machine and loaded as follows (total rest intervening from time of first straining, 64 hours and 20 minutes):					
5, 250	1, 117	0.	.....	.....	Initial load.
26, 250	5, 585	.0522	.0522	.....	
52, 500	11, 170	.1105	.0583	.....	
78, 750	16, 755	.1686	.0581	.....	
105, 000	22, 340	.2280	.0594	.....	
131, 250	27, 925	.2894	.0614	.....	
157, 500	33, 510	.3523	.0629	.....	
183, 750	39, 095	.4175	.0652	.....	
210, 000	44, 680	.4843	.0668	.....	

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
236, 250	50, 265	.5522	.0679	.....	
262, 500	55, 850	.6205	.0683	.....	
236, 250	50, 265	.5647	.0558	.....	
210, 000	44, 680	.5078	.0569	.....	
183, 750	39, 095	.4489	.0589	.....	
157, 500	33, 510	.3888	.0601	.....	
131, 250	27, 925	.3283	.0605	.....	
105, 000	22, 340	.2654	.0629	.....	
78, 750	16, 755	.2024	.0630	.....	
52, 500	11, 170	.1391	.0633	.....	
26, 250	5, 585	.0712	.0679	.....	
5, 250	1, 117	.0134	.0578	.....	
262, 500	55, 850	.6227	.6093	.....	
5, 250	1, 117	.0127	.6100	.....	
262, 500	55, 850	.6245	.6118	.....	
5, 250	1, 117	.0135	.6110	.....	
262, 500	55, 850	.6245	.6110	.....	
5, 250	1, 117	.0142	.6103	.....	Test discontinued.
After a further rest of 73 hours the bar again placed in the testing-machine and loaded as follows (total rest intervening from time of first straining 97 hours 20 minutes):					
5, 250	1, 117	0.	.....	.....	Initial load.
262, 250	5, 585	.0500	.0500	.....	
52, 500	11, 170	.1079	.0579	.....	
78, 750	16, 755	.1642	.0563	.....	
105, 000	22, 340	.2211	.0569	.....	
131, 250	27, 925	.2792	.0581	.....	
157, 500	33, 510	.3401	.0609	.....	
183, 750	39, 095	.4033	.0632	.....	
210, 000	44, 680	.4680	.0647	.....	
236, 250	50, 265	.5350	.0670	.....	
262, 500	55, 850	.0039 .6062	.0689 .0023	....	After 3 minutes' rest.
236, 250	50, 265	.5502	.0560	.....	
210, 000	44, 680	.4935	.0567	.....	
183, 750	39, 095	.4352	.0583	.....	
157, 500	33, 510	.3755	.0597	.....	
131, 250	27, 925	.3154	.0601	.....	
105, 000	22, 340	.2538	.0616	.....	
78, 750	16, 755	.1919	.0619	.....	
52, 500	11, 170	.1301	.0618	.....	
26, 250	5, 585	.0642	.0659	.....	
5, 250	1, 117	.0080	.0562	.....	
262, 500	55, 850	.6079	.5999	.....	
5, 250	1, 117	.0079	.6000	.....	
262, 500	55, 850	.6079	.6000	.....	
5, 250	1, 117	.0086	.5993	.....	Test discontinued.
After a further rest of 29 days bar again placed in the testing-machine and loaded as follows:					
5, 250	1, 117	0.	.....	.....	Initial load.
26, 250	5, 585	.0526	.0526	.....	
52, 500	11, 170	.1112	.0586	.....	E=27, 679, 000.
78, 750	16, 755	.1675	.0563	.....	E=28, 809, 000.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
105,000	22,340	.2237	.0562	.....	E=28,861,000.
131,250	27,925	.2800	.0563	.....	E=28,809,000.
157,500	33,510	.3365	.0565	.....	E=28,707,000.
183,750	39,095	.3935	.0570	.....	E=28,456,000.
210,000	44,680	.4520	.0585	.....	E=27,726,000. Slow yielding under stress. Carried this load 3 minutes.
236,250	50,265	.5084	.0564	.....	E=28,758,000.
262,500	55,850	.5673	.0589	.....	E=27,538,000.
		.5695	.0022	.....	After 3 minutes' rest.
236,250	50,265	.5140	.0555	.....	E=29,225,000.
210,000	44,680	.4583	.0557	.....	E=29,126,000.
183,750	39,095	.4021	.0562	.....	E=28,861,000.
157,500	33,510	.3460	.0561	.....	E=28,912,000.
131,250	27,925	.2895	.0565	.....	E=28,707,000.
105,000	22,340	.2327	.0568	.....	E=28,556,000.
78,750	16,755	.1753	.0574	.....	E=28,257,000.
52,500	11,170	.1188	.0565	.....	E=28,707,000.
26,250	5,585	.0602	.0586	.....	E=27,679,000.
5,250	1,117	.0081	.0521	.....	
		.0067	.0014	.....	After 5 minutes' rest.
26,250	5,585	.0569	.0502	.....	
52,500	11,170	.1147	.0578	.....	E=28,062,000.
78,750	16,755	.1710	.0563	.....	E=28,809,000.
105,000	22,340	.2274	.0564	.....	E=28,758,000.
131,250	27,925	.2839	.0565	.....	E=28,707,000.
157,500	33,510	.3408	.0569	.....	E=28,506,000.
183,750	39,095	.3980	.0572	.....	E=28,355,000.
210,000	44,680	.4550	.0570	.....	E=28,450,000.
183,750	39,095	.3997	.0553	.....	E=29,330,000.
157,500	33,510	.3439	.0558	.....	E=29,067,000.
131,250	27,925	.2876	.0563	.....	E=28,809,000.
105,000	22,340	.2315	.0561	.....	E=28,912,000.
78,750	16,755	.1749	.0566	.....	E=28,657,000.
52,500	11,170	.1183	.0566	.....	E=28,657,000.
26,250	5,585	.0598	.0585	.....	E=27,726,000.
5,250	1,117	.0083	.0515	.....	

No. 4137.



Sectional area of stem, 5.24 square inches.
Gauged length, 260″.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
5,240	1,000	0.	0.	0.	Initial load.
26,200	5,000	.0410	.0010		
52,400	10,000	.0878			
26,200	5,000	.0425	.0017		
78,600	15,000	.1330			
52,400	10,000	.0888			
26,200	5,000	.0433	.0021		
104,800	20,000	.1780			
78,600	15,000	.1340			
52,400	10,000	.0895			
26,200	5,000	.0439	.0029		
131,000	25,000	.2230			
104,800	20,000	.1790			
78,600	15,000	.1348			
52,400	10,000	.0904			
26,200	5,000	.0443	.0035		
157,200	30,000	.2710			
131,000	25,000	.2269			
104,800	20,000	.1830			
78,600	15,000	.1389			
52,400	10,000	.0942			
26,200	5,000	.0479	.0069		
172,000		.2949			
174,000		.3032			
176,000		.3076			
178,000		.3118			
180,000		.3169			
182,000		.3225			
183,400	35,000	.3274			Elastic limit.
157,200	30,000	.2843			
131,000	25,000	.2403			
104,800	20,000	.1960			
78,600	15,000	.1518			
52,400	10,000	.1070			
26,200	5,000	.0608	.0189		
186,000	35,500	.3375 .3400			
188,000		.3685			
190,000		.4285			
192,000		.5800			
193,880	37,000	.9480			
183,400	35,000	.9891			
157,200	30,000	.8945			
131,000	25,000	.8499			
104,800	20,000	.8032			
78,600	15,000	.7569			
52,400	10,000	.7095			
26,200	5,000	.6597	.6140		
	5,000	.6535			
52,400	10,000	.6998			
78,600	15,000	.7458			
104,800	20,000	.7913			
131,000	25,000	.8381			
157,200	30,000	.8856			
183,400	35,000	.9377	.6183		
199,120	38,000	2.07			
204,360	39,000	2.32			
209,600	40,000	2.73		3.31	
183,400	35,000	.4815			
157,200	30,000	.4347			Micrometer reset. Special readings.
131,000	25,000	.3863			

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
104, 800	20, 000	.3350	.....	.....	
78, 600	15, 000	.2821	.....	.....	
52, 400	10, 000	.2283	.....	.....	
26, 200	5, 000	.1681	.1135	.....	
26, 200	5, 000	.1524	.1110	.....	
52, 400	10, 000	.1999	.....	.....	
78, 600	15, 000	.2470	.....	.....	
104, 800	20, 000	.2961	.....	.....	
131, 000	25, 000	.3479	.....	.....	
157, 200	30, 000	.4010	.....	.....	
183, 400	35, 000	.4588	.1178	.....	
183, 400	35, 000	.4583	.1188	.....	
214, 840	41, 000	.....	.....	3.45	
220, 080	42, 000	.....	.....	3.80	
225, 320	43, 000	.....	.....	4.25	
230, 560	44, 000	.....	.....	4.66	
235 800	45, 000	.....	.....	5.05	
241, 040	46, 000	.....	.....	5.53	
246, 280	47, 000	.....	.....	6.02	
251, 520	48, 000	.....	.....	6.40	
256, 760	49, 000	.....	.....	6.85	
262, 000	50, 000	.....	.....	7.36	
267, 240	51, 000	.....	.....	7.87	
272, 480	52, 000	.....	.....	8.53	
277, 720	53, 000	.....	.....	9.04	
282, 960	54, 000	.....	.....	9.64	
288, 200	55, 000	.....	.....	10.30	
293, 440	56, 000	.....	.....	11.10	
298, 680	57, 000	.....	.....	11.75	
303, 920	58, 000	.....	.....	12.57	
309, 160	59, 000	.....	.....	13.50	
314, 400	60, 000	.....	.....	14.40	
319, 640	61, 000	.....	.....	15.50	
324, 880	62, 000	.....	.....	16.55	
330, 120	63, 000	.....	.....	17.70	
335, 360	64, 000	.....	.....	19.00	
340, 600	65, 000	.....	.....	20.67	
343, 700	.....	.....	.....	21.70	
0	0	.....	.....	.....	Rested 12 minutes.
345, 840	66, 000	.....	.....	22.40	
351, 080	67, 000	.....	.....	25.00	
356, 320	68, 000	.....	.....	27.30	
361, 560	69, 000	.....	.....	30.70	
366, 800	70, 000	.....	.....	35.20	
368, 000	70, 229	.....	.....	36.80	Tensile strength.
0	0	30.15	.....	.....	=11.6 per cent.
0	0	.....	.....	34.98	=11.4 per cent.

Elongation of 10-inch sections, ″.76, 1″.22, 1″.27, 1″.21, 1″.26,* 1″.20, 1.″19, 1″.22, 1″.17, 1.″24, 1″.20, 1″.15, 1″.19, 1″.20, 1″.15, 1″.20, 1″.13, 1″.13, 1″.18, 1″.10, 1″.12, 1″.05, 1″.06, 1″.10, 1″.09, 1″.11, 1″.04, 1″.13, ″.75.

Elongation of pin-holes, A ″.55, B ″.50.

Area at fracture, 4″.83 × ″.94 = 4.54 square inches.

Contraction, 13.4 per cent.

Fractured 4½ feet from center of pin-hole A.

Appearance, granular, radiating from a button of hard metal about ½″ diameter, which was rolled into the surface of the bar.

After a rest of 5 days and 18 hours, fractured end B again placed in the machine.

Gauged length, 233″.41, beginning near the fractured end and terminating at the same point at end B as the original gauged length.

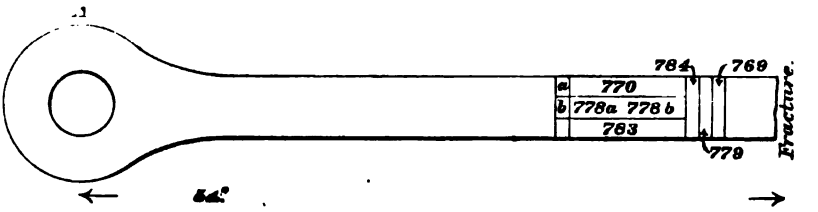
Sectional area called 4.695 square inches.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
5,240	1,116	0.	0.	0.	Initial load.
26,200	5,580	.0383	.0383	.....	
52,400	11,160	.0842	.0459	.....	
78,600	16,740	.1306	.0464	.....	
104,800	22,319	.1792	.0486	.....	
131,000	27,899	.2330	.0538	.....	
157,200	33,479	.2902	.0572	.....	
183,400	39,059	.3530	.0628	.....	
157,200	33,479	.3090	.0440	.....	
131,000	27,899	.2631	.0459	.....	
104,800	22,319	.2159	.0472	.....	
78,600	16,740	.1670	.0489	.....	
52,400	11,160	.1180	.0490	.....	
26,200	5,580	.0671	.0509	.....	
5,240	1,116	.0259	.0412	.....	
26,200	5,580	.0621	.0362	.....	
52,400	11,160	.1080	.0459	.....	
78,600	16,740	.1546	.0466	.....	
104,800	22,319	.2030	.0484	.....	
131,000	27,899	.2531	.0501	.....	
157,200	33,479	.3037	.0506	.....	
183,400	39,059	.3569	.0532	.....	
209,600	44,638	.4200	.0631	.....	
235,800	50,218	.4939	.0739	.....	
262,000	5,580	.5765	.0826	.....	
235,800	50,218	.5320	.0445	.....	
209,600	44,638	.4850	.0470	.....	
183,400	39,059	.4371	.0479	.....	
157,200	33,479	.3876	.0495	.....	
131,000	27,899	.3378	.0498	.....	
104,800	22,319	.2860	.0518	.....	
78,600	16,740	.2330	.0530	.....	
52,400	11,160	.1810	.0520	.....	
26,200	5,580	.1272	.0538	.....	
5,240	1,116	.0810	.0462	.....	
		.0746	.0064	.....	After resting 1 hour.
26,200	5,580	.1121	.0375	.....	
52,400	11,160	.1581	.0460	.....	
78,600	16,740	.2060	.0479	.....	
104,800	22,319	.2541	.0481	.....	
131,000	27,899	.3050	.0509	.....	
157,200	33,479	.3568	.0518	.....	
183,400	39,059	.4089	.0521	.....	
209,600	44,638	.4623	.0534	.....	
235,800	50,218	.5169	.0546	.....	

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
		.5778	.0609	.....	
262, 000	55, 798	.5806	.0028	.....	
		.5830	.0024	.....	
235, 800	50, 218	.5374	.0456	.....	
209, 600	44, 638	.4908	.0466	.....	
235, 800	50, 218	.5368	.0460	.....	
262, 000	55, 798	.5836	.0468	.....	
235, 800	50, 218	.5381	.0445	.....	
209, 600	44, 638	.4917	.0464	.....	
186, 400	39, 059	.4441	.0476	.....	
157, 200	33, 478	.3947	.0494	.....	
183, 400	39, 059	.4404	.0457	.....	
209, 600	44, 638	.4870	.0466	.....	
235, 800	50, 218	.5350	.0480	.....	
262, 000	55, 798	.5844	.0494	.....	
5, 240	1, 116	.0900	.4944	.....	
157, 200	33, 479	.3710	.2810	.....	
183, 400	39, 059	.4230	.0520	.....	
209, 600	44, 638	.4759	.0529	.....	
235, 800	50, 218	.5295	.0536	.....	
262, 000	55, 798	.5850	.0555	.....	
235, 800	50, 218	.5400	.0450	.....	
209, 600	44, 638	.4931	.0469	.....	
183, 400	39, 059	.4459	.0472	.....	
157, 200	33, 479	.3960	.0499	.....	
131, 000	27, 899	.3468	.0492	.....	
104, 000	22, 319	.2947	.0521	.....	
78, 600	16, 739	.2429	.0518	.....	
52, 400	11, 160	.1921	.0508	.....	
26, 200	5, 580	.1370	.0551	.....	
5, 240	1, 116	.0937	.0433	.....	
26, 200	5, 580	.1300	.0363	.....	
262, 000	55, 798	.5860	.4560	.....	
26, 200	5, 580	.1367	.4503	.....	
262, 000	55, 798	.5869	.4502	.....	
26, 200	5, 580	.1389	.4480	.....	
262, 000	55, 798	.5879	.4490	.....	
26, 200	5, 580	.1893	.3986	.....	
262, 000	55, 798	.5887	.3994	.....	
26, 200	5, 580	.1400	.4487	.....	
5, 240	1, 116	.0970	.0430	.....	

Samples taken from steel eye-bar No. 4137 one month and seven days after the original test of the eye-bar.

[Sketch showing positions from whence specimens were taken from the shorter fractured end.]



No. 769, compression specimen.
No. 770, compression specimen.
No. 778*a*, compression specimen, annealed.
No. 778*b*, compression specimen, not annealed.
No. 779, compression specimen, annealed.
No. 783, tension specimen.
No. 784, tension specimen.
(*a* and *b*, specific gravity specimens.)

No. 769.

Compression test.

Crosswise specimen.
Total length, 4″.75.
Diameter, ″.900.
Sectional area, .636 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
636	1,000	0.	0.	Initial load.
3,180	5,000	.0006	0.	
6,360	10,000	.0011	0.	
9,540	15,000	.0016	0.	
12,720	20,000	.0022	0.	
15,900	25,000	.0027	0.	
19,080	30,000	.0032	0.	
22,260	35,000	.0037	0.	
25,440	40,000	.0043	.0001	
28,620	45,000	.0048	.0002	
31,800	50,000	.0055	.0004	
34,980	55,000	.0062	.0006	
38,160	60,000	.0070	.0009	
41,340	65,000	.0080	.0014	
41,976	66,000	.0082	.....	
42,612	67,000	.0085	.....	
43,248	68,000	.0088	.....	
43,884	69,000	.0092	.....	
44,520	70,000	.0095	.0024	
45,156	71,000	.0099	.....	
45,792	72,000	.0103	.....	
46,428	73,000	.0107	.....	
47,064	74,000	.0115	.....	
47,700	75,000	.0122	.0045	
48,336	76,000	.0131	.....	
48,972	77,000	.0139	.....	
49,608	78,000	.0154	.....	
50,244	79,000	.0170	.....	
50,880	80,000	.0193	.0110	
51,516	81,000	.0222	.....	
52,152	82,000	.0260	.....	
52,788	83,000	.0309	.....	
53,424	84,000	.0364	.....	
55,800	87,735	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 770.

Compression test.

Lengthwise specimen.
Total length, 8″.90.
Diameter, ″.900.
Sectional area, .636 square inch.
Gauged length, 6″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
636	1,000	0.	0.	Initial load.
3,180	5,000	.0010	0.	
6,360	10,000	.0020	0.	
9,540	15,000	.0031	.0002	
12,720	20,000	.0043	.0003	
15,900	25,000	.0055	.0005	
19,080	30,000	.0070	.0012	
22,260	35,000	.0102	.0034	
25,440	40,000	.0160	.0081	
28,620	45,000	.0255	.0163	
31,800	50,000	.0376	.0261	
34,980	55,000	.0606	.0486	
35,616	56,000	.0685	.....	
36,252	57,000	.0797	.....	
36,888	58,000	.0975	.....	
38,200	60,062	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 778*a*.

Compression test.

Lengthwise specimen. Annealed end. Heated cherry red and cooled in open air.

Total length, 4″.43.

Diameter, ″.900.

Sectional area, .636 square inch.

Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
636	1,000	0.	0.	Initial load.
3,180	5,000	.0004	0.	
6,360	10,000	.0010	0.	
9,540	15,000	.0015	0.	
12,720	20,000	.0021	0.	
15,900	25,000	.0026	0.	
19,080	30,000	.0032	0.	
19,716	31,000	.0033	.....	
20,352	32,000	.0034	.....	
20,988	33,000	.0035	.....	
21,624	34,000	.0036	.....	
22,260	35,000	.0038	—.0001	
22,896	36,000	.0039	.....	
23,532	37,000	.0040	.....	
24,168	38,000	.0040	.....	
24,804	39,000	.0040	.....	
25,440	40,000	.0041	—.0001	
26,076	41,000	.0042	.....	
26,712	42,000	.0043	.....	
27,348	43,000	.0044	.....	
27,984	44,000	.0044	.....	
28,620	45,000	.0045	—.0002	
29,256	46,000	.0045	.....	Elastic limit.
29,892	47,000	.0116	.....	
30,528	48,000	.0278	.....	
31,164	49,000	.0333	.....	
31,800	50,000	.0410	.....	
53,900	84,748	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 778*b*.

Compression test.

Lengthwise specimen from unannealed end.
Total length, 4″.41.
Diameter, ″.900.
Sectional area, .636 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
636	1,000	0.	0.	Initial load.
3,180	5,000	.0005	0.	
6,360	10,000	.0011	0.	
9,540	15,000	.0016	0.	
12,720	20,000	.0021	0.	
15,900	25,000	.0028	0.	
19,080	30,000	.0035	.0008	
19,716	31,000	.0036	.....	
20,352	32,000	.0039	.....	
20,988	33,000	.0042	.....	
21,624	34,000	.0045	.....	
22,260	35,000	.0049	.0012	
22,896	36,000	.0053	.....	
23,532	37,000	.0056	.....	
24,168	38,000	.0061	.....	
24,804	39,000	.0068	.....	
25,440	40,000	.0074	.0032	
26,076	41,000	.0082	.....	
26,712	42,000	.0089	.....	
27,348	43,000	.0099	.....	
27,984	44,000	.0108	.....	
28,620	45,000	.0118	.0070	
29,256	46,000	.0125	.....	
29,892	47,000	.0136	.....	
30,528	48,000	.0148	.....	
31,164	49,000	.0160	.....	
31,800	50,000	.0175	.0122	
32,436	51,000	.0187	.....	
33,072	52,000	.0200	....	
33,708	53,000	.0210	.....	
34,344	54,000	.0225	.....	
34,980	55,000	.0255	.0195	
35,616	56,000	.0270	.....	
36,252	57,000	.0290	.....	
36,888	58,000	.0308	.....	
37,524	59,000	.0325	.....	
38,160	60,000	.0358	.0290	
38,796	61,000	.0380	.. ..	
39,432	62,000	.0408	.....	
40,068	63,000	.0435	.....	
40,704	64,000	.0467	.....	
41,340	65,000	.0505	.0434	
41,976	66,000	.0540	.....	
42,612	67,000	.0576	.....	
43,248	68,000	.0611	.....	
43,884	69,000	.0670	.....	
44,520	70,000	.0728	.0651	
45,156	71,000	.0783	.....	
45,792	72,000	.0866	.....	
46,428	73,000	.0931	.....	
47,064	74,000	.1045	.....	
47,700	75,000	.1154	.....	
52,890	83,160	.....	.....	Ultimate strength.

Failed by triple flexure.
Maximum diameter at middle, after the test, ″.980.

No. 779.

Compression test.

Crosswise specimen.
Annealed. Heated cherry red and cooled in open air.
Total length, 4″.75.
Diameter, ″.899.
Sectional area .635 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
635	1,000	0.	0.	Initial load.
3,175	5,000	.0006	0.	
6,350	10,000	.0011	0.	
9,525	15,000	.0017	0.	
12,700	20,000	.0022	0.	
15,875	25,000	.0027	—.0001	
19,050	30,000	.0032	—.0001	
22,225	35,000	.0037	—.0001	
25,400	40,000	.0042	—.0001	
26,035	41,000	.0042	.....	
26,670	42,000	.0043	.....	
27,305	43,000	.0044	.....	
27,940	44,000	.0045	.....	
28,575	45,000	.0045	.....	
29,210	46,000	.0046	.....	
29,845	47,000	.0046	.....	
30,480	48,000	.0235	.....	
31,115	49,000	.0404	.....	
31,750	50,000	.0426	.0370	
32,385	51,000	.0443	.....	
33,020	52,000	.0449	.....	
33,655	53,000	.0499	.....	
34,290	54,000	.0530	.....	
34,925	55,000	.0589	.0527	
35,560	56,000	.0620	.....	
36,195	57,000	.0680	.....	
36,830	58,000	.0725	.....	
37,465	59,000	.0771	.....	
38,100	60,000	.0806	.0740	
38,735	61,000	.0836	.....	
39,370	62,000	.0885	.....	
40,005	63,000	.0925	.....	
40,640	64,000	.0961	.....	
41,275	65,000	.1002	.0930	
51,500	81,102	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 783.

Tension test.

Lengthwise specimen.
Total length, 9″.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 6″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0007	0.	
2,500	10,000	.0018	0.	
3,750	15,000	.0028	0.	
5,000	20,000	.0038	0.	
6,250	25,000	.0047	0.	
7,500	30,000	.0058	0.	
8,750	35,000	.0068	0.	
10,000	40,000	.0078	0.	
11,250	45,000	.0088	0.	
12,500	50,000	.0099	0.	
13,750	55,000	.0109	0.	
15,000	60,000	.0120	0.	
16,250	65,000	.0130	0.	
17,500	70,000	.0140	.....	
18,000	72,000	.0144	.....	
18,500	74,000	.0149	.....	
19,000	76,000	.0153	.....	
19,500	78,000	.0159	.....	
20,000	80,000	.0163	.....	
20,500	82,000	.0169	.....	
21,000	84,000	.0172	.....	
21,500	86,000	.0180	.....	
22,000	88,000	.0190	.....	
22,500	90,000	.0206	.....	
22,800	91,200	.....	.....	Tensile strength.

Elongation after fracture, ″.30 = 5.0 per cent.
Elongation of inch sections, ″.*27, ″.03, ″.00, ″.00, ″.00, ″.00.
Diameter at fracture, ″.42.
Area, .1385 square inch.
Contraction, 44.6 per cent.
Fractured $\frac{3}{4}$″ from neck.
Appearance, fine, silky

No. 784.

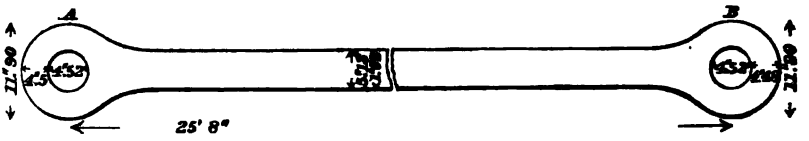
Tension test.

Crosswise specimen.
Total length, 4″.75.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0004	0.	
2,500	10,000	.0009	0.	
3,750	15,000	.0014	0.	
5,000	20,000	.0020	0.	
6,250	25,000	.0025	0.	
7,500	30,000	.0031	.0001	
8,750	35,000	.0037	.0002	
10,000	40,000	.0045	.0005	
11,250	45,000	.0057	.0012	
12,500	50,000	.0072	.0021	
13,750	55,000	.0100	.0043	
14,000	56,000	.0106	.....	
14,250	57,000	.0110	.....	
14,500	58,000	.0118	.....	
14,750	59,000	.0125	.....	
15,000	60,000	.0137	.....	
15,250	61,000	.0148	.....	
15,500	62,000	.0158	.....	
15,750	63,000	.0170	.....	
16,000	64,000	.0191	.....	
16,250	65,000	.0206	.....	
16,500	66,000	.0226	.....	
16,750	67,000	.0246	.....	
17,000	68,000	.0276	.....	
17,250	69,000	.0302	.....	
17,500	70,000	.0337	.....	
17,750	71,000	.0368	.....	
18,000	72,000	.0411	.....	
18,250	73,000	.0437	.....	
19,000	76,000	.060	.....	
19,500	78,000	.085	.....	
20,000	80,000	.11	.....	
20,400	81,600	.21	.....	Tensile strength.
19,100	.....	.....	.....	Load at time of rupture.

Elongation after rupture, ″.36 = 6.0 per cent.
Elongation of inch sections, ″.*15, ″.13, ″.08.
Diameter at fracture, ″.47.
Area, .1735 square inch.
Contraction, 30.6 per cent.
Fractured, 1″.00 from neck.
Appearance, granular, 40 per cent.; silky, flaky, 60 per cent.

No. 4138.



Sectional area of stem, 5.23 square inches.
Gauged length, 260″.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
5,230	1,000	0.	0.	0.	Initial load.
26,150	5,000	.0418	0.		
52,300	10,000	.0879	0.		
78,450	15,000	.1324	0.		
104,600	20,000	.1770	0.		
130,750	25,000	.2228	.0004		
156,900	30,000	.2705			
130,750	25,000	.2269			
104,600	20,000	.1833			
78,450	15,000	.1377			
52,300	10,000	.0930			
26,150	5,000	.0460	.0037		
170,000		.2961			
172,000		.2987			
174,000		.3034			
176,000		.3069			
178,000		.3110			
180,000		.3149			
182,000		.3194			
183,050	35,000	.3231	.0098		
184,000		.3269			
186,000		.3317			
188,000	35,950	.3379			Elastic limit.
190,000		.3510			
192,000		.3680			
193,510	37,000	.3920			
198,740	38,000	.6540			
203,970	39,000	1.60		1.85	
209,200	40,000			2.25	
214,430	41,000			2.82	
219,660	42,000			3.20	
224,890	43,000			3.56	
230,120	44,000			3.99	
235,350	45,000			4.32	
240,580	46,000			4.72	
245,810	47,000			5.15	
251,040	48,000			5.56	
256,270	49,000			6.03	
261,500	50,000			6.50	
266,730	51,000			6.95	
271,960	52,000			7.42	
277,190	53,000			7.96	
282,420	54,000			8.51	
287,650	55,000			9.10	
292,880	56,000			9.68	
298,110	57,000			10.33	
303,340	58,000			11.01	
308,570	59,000			11.76	
313,800	60,000			12.60	
319,030	61,000			13.40	
324,260	62,000			14.28	
329,490	63,000			15.25	
334,720	64,000			16.40	
339,950	65,000			17.54	
345,180	66,000			18.90	
350,410	67,000			20.58	
353,500				21.65	
0	0			20.53	
355,640	68,000			22.50	
360,870	69,000			25.20	

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
366, 100	70, 000	.....	.....	28. 40	
371, 330	71, 000	.....	.....	32. 30	
374, 900	71, 680	.....	.....	36. 60	Maximum load reached. Stretching still going on, and load slowly advancing.
0	0	30. 64	.....	.....	=11.8 per cent.
0	0	.....	.....	35. 38	=11.5 per cent.

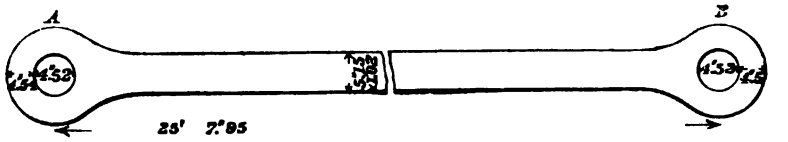
Elongation of inch sections, ″.73, 1″.16, 1″.14, 1″.11, 1″.10, 1″12, 1″.12, 1″.09, 1″.10, 1″.13, 1″.14, 1″.15, 1″.19, 1″.20, 1″.19, 1″.21, 1″.23, 1″.22, 1″.18, 1″.22, 1″.14, 1″.17, 1″.24, 1″.26, 1″.24, 1″.28, 1″.27, ″.71.

Elongation of pin-holes, A ″.49, B ″51.

Area at middle of length of stem, 4″.84 × ″.94 = 4.55 square inches.

Contraction, 14.0 per cent.

No. 4139.



Sectional area of stem, 5.25 square inches.
Gauged length, 260″.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
5,250	1,000	0.	0.	0.	Initial load.
26,250	5,000	.0450	.0051	.....	
52,500	10,000	.0890	.0052	.....	E = 29,612,000.
78,750	15,000	.1332	.0060	.....	E = 29,953,000.
105,000	20,000	.1768	.0060	.....	E = 29,816,000.
131,250	25,000	.2222	.0083	.....	E = 30,162,000.
157,500	30,000	.2722	.....	.....	
131,250	25,000	.2280	.....	.....	
105,000	20,000	.1850	.....	.....	
78,750	15,000	.1413	.....	.....	
52,500	10,000	.0980	.....	.....	
26,250	5,000	.0530	.0136	.....	
170,000	.....	.2970	.....	.....	
172,000	.....	.3009	.....	.....	
174,000	.....	.3049	.....	.....	
176,000	.....	.3092	.....	.....	
178,000	.....	.3149	.....	.....	
180,000	.....	.3185	.....	.....	
182,000	.....	.3240	.....	.....	
183,750	35,000	.3293	.....	.....	Elastic limit.
157,500	30,000	.2860	.....	.....	
131,250	25,000	.2427	.....	.....	
105,000	20,000	.1990	.....	.....	
78,750	15,000	.1550	.....	.....	
52,500	10,000	.1111	.....	.....	
26,250	5,000	.0662	.0268	.....	
186,000	.....	.3371	.....	.....	
188,000	.....	.3480	.....	.....	
190,000	.....	.3594	.....	.....	
192,000	.....	.3696	.....	.....	
194,250	37,000	.4602	.....	.....	
183,750	.....	.4488	.....	.....	
157,500	.....	.4050	.....	.....	
131,250	.....	.3610	.....	.....	
105,000	.....	.3163	.....	.....	
78,750	.....	.2726	.....	.....	
52,500	.....	.2281	.....	.....	
26,250	.....	.1824	.....	.....	
5,250	.....	.1418	.....	.....	
199,500	38,000	.9970	.....	.....	

Sectional area now called 5.237 square inches.

Applied loads.		In gauged length.		Elongation (center to to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
183,750	35,069	.9844	.0126	.....	
157,500	30,076	.9407	.0437	.....	E = 29,899,000.
131,250	25,064	.8960	.0447	.....	E = 29,230,060.
105,000	20,051	.8501	.0459	.....	E = 28,466,000.
78,750	15,038	.8031	.0470	.....	E = 27,800,000.
52,500	10,025	.7568	.0463	.....	E = 28,220,000.
26,250	5,013	.7067	.0501	.....	E = 26,080,000.
5,250	1,003	.6614	.0453	.....	
200,000	.....	.....	.....	.....	This load applied and left on the bar 16 hours; in the mean time the load fell to 124,000 pounds on account of stretching of the bar and leakage of the hydraulic packings of the testing-machine.
5,250	1,003	.72	.....	.....	

Gauged length, 260."72.
Sectional area called 5.235 square inches.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inch.*	
5,250	1,003	0.	0.	.....	Micrometer reset.
26,250	5,014	.0394	.0394	.....	
52,500	10,028	.0847	.0453	.....	E = 28,856,000.
78,750	15,042	.1298	.0451	.....	E = 28,984,000.
105,000	20,055	.1752	.0454	.....	E = 28,793,000.
131,250	25,069	.2211	.0459	.....	E = 28,479,000.
157,500	30,083	.2687	.0476	.....	E = 27,462,000.
183,750	35,097	.3175	.0488	.....	E = 26,787,000.
157,500	30,083	.2745	.0430	.....	E = 30,400,000.
131,250	25,069	.2300	.0445	.....	E = 29,375,000.
105,000	20,055	.1852	.0448	.....	E = 29,188,000.
78,750	15,042	.1400	.0452	.....	E = 28,920,000.
52,500	10,028	.0939	.0461	.....	E = 28,355,000.
26,250	5,014	.0432	.0507	.....	E = 25,733,000.
5,250	1,003	.0027	.0405	.....	
204,750	39,000	2.08	.....	.....	
210,000	40,000	2.73	.....	.....	

Gauged length, 262″.73.
Sectional area called 5.195 square inches.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inches.*	
5, 250	1, 010	0.	.....	.....	Micrometer reset.
26, 250	5, 052	.0409	.0409	.....	
52, 500	10, 105	.0878	.0469	.....	E = 28, 303, 000.
78, 750	15, 158	.1341	.0463	.....	E = 28, 670, 000.
105, 000	20, 210	.1833	.0492	.....	E = 26, 980, 000.
131, 250	25, 263	.2338	.0505	.....	E = 26, 286, 000.
157, 500	30, 315	.2867	.0529	.....	E = 25, 093, 000.
183, 750	35, 368	.3440	.0573	.....	E = 21, 366, 000.
157, 500	30, 315	.2992	.0448	.....	E = 29, 630, 000.
131, 250	25, 263	.2539	.0453	.....	E = 29, 302, 000.
105, 000	20, 210	.2068	.0471	.....	E = 28, 183, 000.
78, 750	15, 158	.1581	.0487	.....	E = 27, 257, 000.
52, 500	10, 105	.1083	.0498	.....	E = 26, 655, 000.
26, 250	5, 052	.0546	.0537	.....	E = 24, 719, 000.
5, 250	1, 010	.0071	.0475	.....	
215, 250	41, 000	.....	.....	3. 50	
220, 500	42, 000	.....	.....	3. 70	
225, 750	43, 000	.....	.....	3. 93	
231, 000	44, 000	.....	.....	4. 28	
236, 250	45, 000	.....	.....	4. 75	
241, 500	46, 000	.....	.....	5. 17	
246, 750	47, 000	.....	.....	5. 68	
252, 000	48, 000	.....	.....	6. 08	
257, 250	49, 000	.....	.....	6. 50	
262, 500	50, 000	.....	.....	7. 00	
267, 750	51, 000	.....	.....	7. 49	
273, 000	52, 000	.....	.....	8. 05	
278, 250	53, 000	.....	.....	8. 60	
283, 500	54, 000	.....	.....	9. 12	
288, 750	55, 000	.....	.....	9. 70	
294, 000	56, 000	.....	.....	10. 40	
299, 250	57, 000	.....	.....	11. 09	
304, 500	58, 000	.....	.....	11. 71	
309, 750	59, 000	.....	.....	12. 45	
315, 000	60, 000	.....	.....	13. 35	
320, 250	61, 000	.....	.....	14. 32	
325, 500	62, 000	.....	.....	15. 35	
330, 750	63, 000	.....	.....	16. 48	
336, 000	64, 000	.....	.....	17. 70	
341, 250	65, 000	.....	.....	19. 10	
346, 500	66, 000	.....	.....	20. 75	
348, 500	.....	.....	.....	21. 55	
0	0	.....	.....	20. 50	
351, 750	67, 000	.....	.....	23. 20	
357, 000	68, 000	.....	.....	24. 90	
362, 250	69, 000	.....	.....	27. 55	
367, 500	70, 000	.....	.....	31. 60	
372, 200	70, 895	.....	.....	37. 80	Maximum load.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inches.*	*Inches.*	*Inch.*	
5,250	1,000	.....	.....	36.53	
0	0	31.46	.....	.....	=12.1 per cent.
0	0	.....	.....	36.38	=11.8 per cent.

Elongation of 10-inch sections, ".78, 1".30, 1".10, 1".16, 1".16, 1".16, 1".20, 1".14, 1".19, 1".20, 1".16, 1".22, 1".23, 1".26, 1".27, 1".24, 1".25, 1".21, 1".21, 1".21, 1".26, 1".22, 1".22, 1".22, 1".21, 1".27, 1".25, 1".24, 1".23, ".77.

Elongation of pin-holes, A ".42, B ".54.

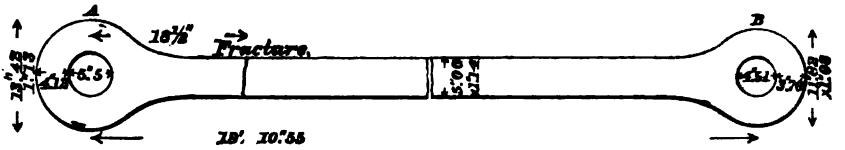
Gauged length, 291".46.

Sectional area called 4.683 square inches.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
5,250	1,121	0.	.....	.....	Micrometer reset.
26,250	5,605	.0502	.0502	.....	
52,500	11,210	.1093	.0591	.....	E=27,641,000.
78,750	16,815	.1691	.0598	.....	E=27,318,000.
105,000	22,420	.2322	.0631	.....	E=25,889,000.
131,250	28,025	.2963	.0641	.....	E=25,485,000.
157,500	33,630	.3622	.0659	.....	E=24,789,000.
183,750	39,235	.4299	.0677	.....	E=24,130,000.
157,500	33,630	.3731	.0568	.....	E=28,761,000.
131,250	28,025	.3150	.0581	.....	E=28,127,000.
105,000	22,420	.2561	.0599	.....	E=27,272,000
78,750	16,815	.1930	.0621	.....	E=26,306,000.
52,500	11,210	.1305	.0625	.....	E=26,138,000.
26,250	5,605	.0696	.0609	.....	
5,250	1,121	.0077	.0559	.....	
26,250	5,605	.0550	.0473	.....	
52,500	11,210	.1141	.0591	.....	
78,750	16,815	.1739	.0598	.....	
105,000	22,420	.2353	.0614	.....	
131,250	28,025	.2981	.0628	.....	
157,500	33,630	.3640	.0659	.....	Rested under load 10 minutes.
183,750	39,235	.4270	.0630	.....	
210,000	45,014	.4930	.0660	.....	
236,250	50,448	.5640	.0710	.....	
262,500	56,053	.6380	.0740	.....	
236,250	50,448	.5802	.0578	.....	
210,000	45,014	.5219	.0583	.....	
183,750	39,235	.4621	.0598	.....	
157,500	33,630	.3993	.0628	.....	
131,250	28,025	.3373	.0620	.....	
105,000	22,420	.2730	.0643	.....	
78,750	16,815	.2060	.0670	.....	
52,500	11,210	.1428	.0632	.....	
26,250	5,605	.0719	.0709	.....	
5,250	1,121	.0123	.0596	.....	
262,500	56,053	.6364	.6241	.....	
5,250	1,121	.0130	.6234	.....	Test discontinued.

DETAILS OF TESTS OF WROUGHT-IRON EYE-BARS.

No. 763.



Sectional area of stem, 5.70 square inches.
Gauged length, 180″.
Twenty-two 10-inch sections laid off along stem.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inches.*	*Inches.*	
5,700	1,000	0.	0.	0.	Initial load.
28,500	5,000	.0310	.0034	.....	
57,000	10,000	.0647	.0044	.....	E = 27,522,000.
85,500	15,000	.0995	.0170	.....	E = 27,774,000.
102,600	18,000	.1237	.0120	.....	
114,000	20,000	.1453	.0208	.....	E = 28,125,000.
116,000	.....	.1499	.....	.....	
118,000	.....	.1538	.....	.....	
120,000	.....	.1575	.....	.....	
122,000	.....	.1609	.....	.....	
124,000	.....	.1658	.....	.....	
126,000	.....	.1720	.....	.....	
128,000	22,456	.1803	.....	.....	Elastic limit.
130,000	.....	.2030	.....	.....	
132,000	.....	.2200	.....	.....	
134,000	.....	.2458	.....	.....	
136,800	24,000	.3040	.....	.....	
142,500	25,000	.5500	.....	.76	
148,200	26,000	1.12	.....	1.42	
153,900	27,000	1.44	.....	1.80	
159,600	28,000	1.69	.....	2.13	
165,300	29,000	2.27	.....	2.88	Set.
171,000	30,000	2.85	2.62	3.59	3″.25.

Sectional area now called 5.493 square inches.
Gauged length 182″.62.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
5,700	1,039	0.	0.	.....	Micrometer reset.
28,500	5,191	.0278	.0278	.....	
57,000	10,382	.0625	.0347	.....	E = 27,318,000.
85,500	15,573	.0987	.0362	.....	E = 26,186,000.
114,000	20,764	.1359	.0372	.....	E = 25,483,000.
85,500	15,573	.1024	.0335	.....	
57,000	10,382	.0680	.0344	.....	
28,500	5,191	.0318	.0362	.....	
5,700	1,039	.0013	.0305	.....	

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
5,700	1,039	—.0002	.0015	.....	After ½ hour's rest.
28,500	5,191	.0277	.0279	.....	
57,000	10,382	.0625	.0348	.....	
85,500	15,573	.0977	.0352	.....	
114,000	20,764	.1334	.0357	.....	
142,500	25,955	.1713	.0379	.....	
114,000	20,764	.1377	.0336	.....	
85,500	15,573	.1034	.0343	.....	
57,000	10,382	.0684	.0350	.....	
28,500	5,191	.0320	.0364	.....	
5,700	1,039	.0014	.0306	.....	
176,700	31,000	.....	.....	3.62	
182,400	32,000	.....	.....	3.70	
188,100	33,000	.....	.....	5.28	
193,800	34,000	.....	.....	6.12	
199,500	35,000	.....	.....	6.97	
205,200	36,000	.....	.....	8.02	
210,900	37,000	.....	.....	9.07	
216,600	38,000	.....	.....	10.20	
222,300	39,000	.....	.....	11.57	
228,000	40,000	.....	.....	13.15	
233,700	41,000	.....	.....	14.85	
239,400	42,000	.....	.....	17.05	
245,100	43,000	.....	.....	19.50	
250,800	44,000	.....	.....	22.45	
0	0	.....	.....	.....	Rested 5 minutes.
256,500	45,000	.....	.....	27.00	
257,100	45,105	.....	.....	27.50	Tensile strength.
.....	.....	.....	.....	27.80	Just before fracture.
0	0	21.01	.....	.....	= 11.7 per cent.
0	0	.....	.....	27.66	= 11.6 per cent.

Elongation of 10-inch sections, *2″.18, 1″.34, 1″.56, 1″.43, 1″.28, 1″.28, 1″.28, 1″.20, 1″.22, 1″.15, 1″.09, 1″.09, 1″.10, 1″.10, 1″.08, 1″.09, 1″.02, 1″.02, 1″.05, 1″.12, 1″.23, 1″.02, ″.81.

Area at fracture, 4″.22 × ″.93 = 3.92 square inches.

Contraction, 31.2 per cent.

One edge of fracture open ″.13. Open at middle ″.15. One edge closed.

Fractured 18½″ from center of pin-hole A. Appearance, fibrous, with traces of granulation.

Elongation of pin-holes, A ″.47, B ″.41.

Fractured end loaded after 16 hours' rest.

Gauged length now 178″.72; beginning three sections from fracture at end A, and terminating at the end of original gauged length, end B. This includes sixteen of the original 10-inch sections.

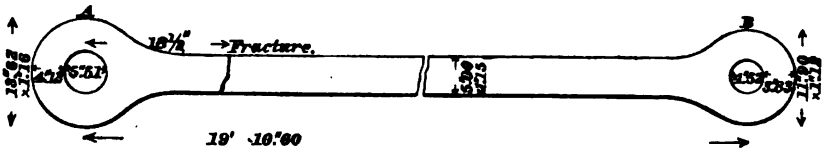
Sectional area now called 5.103 square inches.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
5,700	1,117	0.	0.	.....	Initial load.
28,500	5,585	.0317	.0317	.....	
57,000	11,170	.0691	.0374	.....	
85,500	16,754	.1060	.0369	.....	
114,000	22,339	.1435	.0375	.....	
85,500	16,754	.1072	.0363	.....	
57,000	11,170	.0712	.0360	.....	
28,500	5,585	.0339	.0373	.....	
5,700	1,117	.0030	.0309	.....	
28,500	5,585	.0332	.0302	.....	
57,000	11,170	.0701	.0369	.....	
85,500	16,754	.1068	.0367	.....	
114,000	22,339	.1440	.0372	.....	
142,500	27,924	.1815	.0375	.....	
171,000	33,509	.2205	.0390	.....	
142,500	27,924	.1843	.0362	.....	E=27,572,000.
114,000	22,339	.1479	.0364	.....	E=27,421,000.
85,000	16,754	.1109	.0370	.....	E=26,976,000.
57,000	11,170	.0741	.0368	.....	E=27,1[illegible]000.
28,500	5,585	.0365	.0376	.....	E=26,545,000.
5,700	1,117	.0051	.0314	.....	
28,500	5,585	.0352	.0301	.....	
57,000	11,170	.0723	.0371	.....	
85,500	16,754	.1092	.0369	.....	
114,000	22,339	.1466	.0374	.....	
142,500	27,924	.1833	.0367	.....	
171,000	33,509	.2203	.0370	.....	
199,500	39,094	.2609	.0406	.....	
228,000	44,678	.3073	.0464	.....	
199,500	39,094	.2711	.0362	.....	
171,000	33,509	.2348	.0363	.....	
142,500	27,924	.1977	.0371	.....	
114,000	22,339	.1607	.0370	.....	
85,500	16,754	.1234	.0373	.....	
57,000	11,170	.0854	.0380	.....	
28,500	5,585	.0473	.0381	.....	
5,700	1,117	.0147	.0326	.....	
28,500	5,585	.0447	.0300	.....	
57,000	11,170	.0815	.0368	.....	
85,500	16,754	.1188	.0373	.....	
114,000	22,339	.1564	.0376	.....	
142,500	27,924	.1942	.0378	.....	
171,000	33,509	.2320	.0378	.....	
199,500	39,094	.2702	.0382	.....	
171,000	33,509	.2334	.0368	.....	E=27,123,000.
142,500	27,924	.1969	.0365	.....	E=27,345,000.
114,000	22,339	.1596	.0363	.....	E=27,496,000.
85,500	16,754	.1224	.0372	.....	E=26,831,000.
57,000	11,170	.0842	.0382	.....	E=26,759,000.
28,500	5,585	.0469	.0373	.....	
5,700	1,117	.0148	.0321	.....	

Bar again loaded after 26 hours' additional rest. Gauged length (as before), 178".72.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
5,700	1,117	0.	0.	.....	Initial load. Micrometer reset.
28,500	5,585	.0295	.0295	.....	
57,000	11,170	.0660	.0365	.....	
85,500	16,754	.1027	.0367	.....	
114,000	22,339	.1395	.0368	.....	
142,500	27,924	.1769	.0374	.....	
171,000	33,509	.2142	.0373	.....	
142,500	27,924	.1780	.0362	.....	E=27,572,000.
114,000	22,339	.1416	.0364	.....	E=27,421,000.
85,500	16,754	.1050	.0366	.....	E=27,271,000.
57,000	11,170	.0688	.0362	.....	E=27,572,000.
28,500	5,585	.0320	.0368	.....	E=27,123,000.
5,700	1,117	.0021	.0299	.....	
Test resumed after additional rest of 5 days 1½ hours.					
5,700	1,117	0.	0.	0.	Initial load. Micrometer reset.
28,500	5,585	.0306	.0306	.....	
57,000	11,170	.0686	.0380	.....	
85,500	16,754	.1058	.0372	.....	
114,000	22,339	.1430	.0372	.....	
142,500	27,924	.1800	.0370	.....	
114,000	22,339	.1435	.0365	.....	
85,500	16,754	.1070	.0365	.....	
57,000	11,170	.0702	.0368	.....	
28,500	5,585	.0327	.0375	.....	
5,700	1,117	.0018	.0309	.....	
28,500	5,585	.0320	.0302	.....	
57,000	11,170	.0693	.0373	.....	
85,500	16,754	.1064	.0371	.....	
114,000	22,339	.1435	.0371	.....	
142,500	27,924	.1803	.0368	.....	
171,000	33,509	.2170	.0367	.....	
142,500	27,924	.1806	.0364	.....	E=27,421,000.
114,000	22,339	.1442	.0364	.....	E=27,421,000.
85,500	16,754	.1076	.0366	.....	E=27,271,000.
57,000	11,170	.0710	.0366	.....	E=27,271,000.
28,500	5,585	.0334	.0376	.....	E=26,545,000.
5,700	1,117	.0023	.0311	.....	

No. 764.



Sectional area of stem, 5.75 square inches.
Gauged length, 180″.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
5,750	1,000	0.	0.	0.	Initial load.
28,750	5,000	.0252	.0006	.....	
57,500	10,000	.0564	.0013	.....	E = 29,508,000.
86,250	15,000	.0894	.0030	.....	E = 28,753,000.
115,000	20,000	.1308	.0117	.....	E = 27,522,000.
.....	5,000	.0368	.....	.....	
.....	10,000	.0680	.....	.....	
.....	15,000	.0997	.....	.....	
.....	20,000	.1324	.....	.....	
120,000	.....	.1402	.....	.....	
122,000	.....	.1434	.....	.....	
124,000	.....	.1473	.....	.....	
126,000	.....	.1513	.....	.....	
128,000	.....	.1555	.....	.....	
130,000	22,610	.1618	.....	.....	Elastic limit.
132,000	.....	.1725	.....	.....	
134,000	.....	.1845	.....	.....	
136,000	.....	.2035	.....	.....	
138,000	24,000	.2360	.....	.....	
140,000	.....	.2725	.....	.....	
143,750	25,000	.29	.....	.48	
149,500	26,000	.43	.....	.69	
155,250	27,000	1.04	.....	1.39	
161,000	28,000	1.56	.....	2.03	
166,750	29,000	.....	.....	2.50	
172,500	30,000	.....	.....	2.92	
178,250	31,000	.....	.....	3.60	
184,000	32,000	.....	.....	4.25	
189,750	33,000	.....	.....	5.01	
195,500	34,000	.....	.....	5.78	
201,250	35,000	.....	.....	6.63	
207,000	36,000	.....	.....	7.60	
212,750	37,000	.....	.....	8.62	
218,500	38,000	.....	.....	9.75	
224,250	39,000	.....	.....	11.09	
230,000	40,000	.....	.....	12.65	
235,750	41,000	.....	.....	14.20	
241,500	42,000	.....	.....	16.48	
247,250	43,000	.....	.....	18.72	
253,000	44,000	.....	.....	22.40	
0	0	.....	.....	.....	Rested 5 minutes.
256,100	44,540	.....	.....	22.60	Tensile strength.
0	0	16.94	.....	.....	= 9.4 per cent.
0	0	.....	.....	22.34	= 9.4 per cent.

Elongation of 10-inch sections, *1″.77, 1″.10, 1″.07, 1″.06, ″.96 ″.91, ″.88, ″.89, ″.88, ″.90, ″.92, ″.92, ″.93, ″.93, ″.91, ″.83, ″.92, ″.93, 1″.00, 1″.10, ″.91, ″.83.

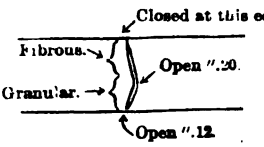
Elongation of pin-holes, A ″.31, B ″.35.

Area at fracture, 4.″36×.″93=4.05 square inches.

Contraction, 29.6.

Fractured 18½″ from center of pin-hole A.

Appearance, granular, 30 per cent.; fibrous, 70 per cent.

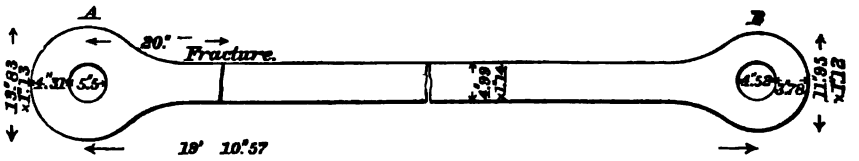


One-half hour after fracture bar again loaded.
Gauged length, 185″.92.
Gauged length includes seventeen of the original 10-inch sections, terminating at end B at same point as original gauged length.
Sectional area now called 5.2588 square inches.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
5,750	1,093	0.	0.	0.	Initial load.
28,750	5,467	.0305	.0305	.....	
57,500	10,934	.0701	.0396	.....	
86,250	16,400	.1093	.0392	.....	
115,000	21,868	.1508	.0415	.....	
143,750	27,335	.1947	.0439	.....	
172,500	32,801	.2401	.0454	.....	
143,753	27,335	.2030	.0371	.....	E=27,396,000.
115,000	21,868	.1645	.0385	.....	E=26,400,000.
86,250	16,400	.1252	.0393	.....	E=25,863,000.
57,500	10,934	.0856	.0396	.....	E=25,067,000.
28,750	5,467	.0449	.0407	.....	E=24,973,000.
5,750	1,093	.0107 .0083	.0342 .0176	.....	After 40 minutes' rest.
5,750	1,093	.0004	.0079	.....	After 16 hours' rest.
28,750	5,467	.0316	.0312	.....	
57,500	10,934	.0701	.0385	.....	
86,250	16,400	.1079	.0378	.....	
115,000	21,868	.1464	.0385	.....	
143,750	27,335	.1847	.0383	.....	
172,500	32,801	.2234	.0387	.....	
143,750	27,335	.1857	.0377	.....	
115,000	21,868	.1481	.0376	.....	
86,250	16,400	.1100	.0381	.....	
57,500	10,934	.0722	.0378	.....	
28,750	5,467	.0335	.0387	.....	
5,750	1,093	.0017	.0318	.....	
172,500	32,801	.2236	.2219	.....	
5,750	1,093	.0017	.2219	.....	
Test resumed after 5 days and 3 hours' rest.					
5,750	1,093	0.	0.	.....	Initial load. Micrometer reset.
28,750	5,467	.0310	.0310	.....	
57,500	10,934	.0697	.0387	.....	
86,250	16,400	.1076	.0379	.....	
115,000	21,868	.1462	.0386	.....	
143,750	27,335	.1841	.0379	.....	
172,500	32,801	.2221	.0380	.....	
143,750	27,335	.1845	.0376	.....	E=27,032,000.
115,000	21,868	.1470	.0375	.....	E=27,104,000.
86,250	16,400	.1090	.0380	.....	E=26,747,000.
57,500	10,934	.0711	.0379	.....	E=26,818,000.
28,750	5,467	.0322	.0389	.....	E=26,129,000.
5,750	1,093	.0006	.0316	.....	
28,750	5,467	.0316	.0310	.....	
57,500	10,934	.0701	.0385	.....	

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
86, 250	16, 400	.1082	.0381	.....	
115, 000	21, 868	.1464	.0382	.....	
143, 750	27, 335	.1841	.0377	.....	
172, 500	32, 801	.2220	.0379	.....	
143, 750	27, 335	.1844	.0376	.....	
115, 000	21, 868	.1471	.0373	.....	
86, 250	16, 400	.1091	.0380	.....	
115, 000	21, 868	.1470	.0379	.....	
143, 750	27, 335	.1845	.0375	.....	
172, 500	32, 801	.2224	.0379	.....	
143, 750	27. 335	.1844	.0380	.....	E=26, 747, 000.
115, 000	21, 868	.1470	.0374	.....	E=27, 177, 000.
86, 250	16, 400	.1090	.0380	.....	E=26, 747, 000.
57, 500	10, 934	.0713	.0377	.....	E=26, 960, 000.
28, 750	5, 467	.0324	.0389	.....	E=26, 129, 000.
5, 750	1, 093	.0004	.0320	.....	

No. 765.



Sectional area of stem, 5.69 square inches.
Gauged length, 180″.
Kinks in stem.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
5, 690	1, 000	0.	0.	0.	Initial load.
28, 450	5, 000	.0386	.0055	.....	
56, 900	10, 000	.0680	.0062	.....	E=27, 950, 000.
85, 350	15, 000	.1030	.0093	.....	
113, 800	20, 000	.1520	.0258	.24	
116, 000	.....	.1600	.....	.....	
118, 000	.....	.1622	.....	.....	
120, 000	.....	.1685	.....	.....	
122, 000	.....	.1730	.....	.....	
124, 000	21, 790	.1778	.....	.....	Elastic limit.
126, 000	.....	.1849	.....	.....	
128, 000	.....	.1965	.....	.....	
130, 000	.....	.2120	.....	.....	
132, 000	.....	.2330	.....	.....	
134, 000	.....	.2495	.....	.....	
136, 560	24, 000	.2901	.....	.47	
142, 250	25, 000	.46	.....	.68	
147, 940	26, 000	.....	.....	.86	
153, 630	27, 000	.....	.....	1. 35	
159, 320	28, 000	.....	.....	1. 83	
165, 010	29, 000	.....	.....	2. 21	
170, 700	30, 000	.....	.....	2. 86	

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
176, 390	31, 000	.....	.....	3. 40	
182, 080	32, 000	.....	.....	4. 12	
187, 770	33, 000	.....	.....	4. 85	
193, 460	34, 000	.....	.....	5. 62	Sharp snapping sound.
199, 150	35. 000	.....	.....	6. 64	
204, 840	36, 000	.....	.....	7. 60	
210, 530	37, 000	.....	.....	8. 65	
216, 220	38, 000	.....	.....	9. 87	
221, 910	39, 000	.....	.....	11. 12	Set.
227, 600	40, 000	.....	.....	13. 10	12″.58.
		Bar rested under zero load 1 hour.			
5, 690	1, 000	0.	0.	0.	Initial load. Micrometer reset.
28, 450	5, 000	. 0302	.....	.....	
56, 900	10, 000	. 0683	.....	.....	
85, 350	15, 000	. 1064	.....	.....	
113, 800	20, 000	. 1455	.....	.....	
85, 350	15, 000	. 1853	.....	.....	
113, 800	20, 000	.....	.....	.....	
142, 250	25, 000	.....	.....	.....	
113, 800	20, 000	.....	.....	.....	
85, 350	15, 000	.....	.....	.....	
56, 900	10, 000	.....	.....	.....	
28, 450	5, 000	.....	.....	.....	
5, 690	1, 000	.....	.....	.....	
233, 290	41, 000	.....	.....	13. 12	
238, 980	42, 000	.....	.....	13. 48	
244, 670	43, 000	.....	.....	18. 15	
246, 500	43, 320	.....	.....	19. 70	Tensile strength.
0	0	14. 04	.....	.....	=7.8 per cent.
0	0	.....	.....	19. 14	=8.0 per cent.

Elongation of 10-inch sections: * 1″.59, 1″.25, ″.92, ″.86, ″.78, ″.71, ″.73, ″.71, ″.81, ″.77, ″.79, ″.76, ″.78, ″.79, ″.75, ″.74, ″.73, ″.78, ″.81, ″.92, ″.77, ″.71.

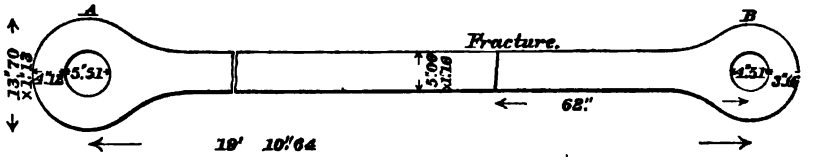
Elongation of pin-holes, A ″.33, B ″.28.

Area at fracture 4″.36 × ″.96 = 4.19 square inches.

Contraction, 26.4 per cent.

Fractured 20″ from center of pin-hole A. Appearance, fibrous, 70 per cent.; granular, 30 per cent. Opened cracks in surface of stem 41″ from center of pin-hole A and 15″ and 37″ from center of pin-hole B. These cracks were in sight when 40,000 pounds tension had been applied to the bar.

No. 766.



Sectional area of stem, 5.80 square inches.
Gauged length, 180".

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
5,800	1,000	0.	0.	0.	Initial load.
29,000	5,000	.0310	.0031	.....	
58,000	10,000	.0662	.0044	.....	E = 27,355,000.
87,000	15,000	.1028	.0078	.....	Set.
116,000	20,000	.1512	.0236	.26	".05.
118,000	.....	.1582	.....	.....	
120,000	.....	.1627	.....	.....	
122,000	.....	.1674	.....	.....	
124,000	.....	.1717	.....	.....	
126,000	.....	.1760	.....	.....	
128,000	.....	.1815	.....	.....	
130,000	22,410	.1890	.....	.....	Elastic limit.
132,000	.....	.2000	.....	.....	
133,400	23,000	.225	.....	.35	
136,000	.....	.24	.....	.....	
138,000	.....	.26	.....	.....	
139,200	24,000	.28	.....	.....	
145,000	25,000	.38	.....	.57	
150,800	26,000	.....	.....	.80	
156,600	27,000	.....	.....	1.32	
162,400	28,000	.....	.....	1.70	
168,200	29,000	.....	.....	2.22	
174,000	30,000	.....	.....	2.81	
179,800	31,000	.....	.....	3.40	
185,600	32,000	.....	.....	4.20	
191,400	33,000	.....	.....	4.93	
197,200	34,000	.....	.....	5.70	
203,000	35,000	.....	.....	6.72	
208,800	36,000	.....	.....	7.76	
214,600	37,000	.....	.....	8.95	
220,400	38,000	.....	.....	10.11	
226,200	39,000	.....	.....	11.40	
229,400	39,550	.....	.....	12.25	Tensile strength.
0	0	9.20	.....	.....	= 5.1 per cent.
0	0	.....	.....	11.40	= 4.8 per cent.

Elongation of 10-inch sections, ".49, ".52, ".52, ".50, ".48, ".48, ".47, ".47, ".47, ".47, ".47, ".45, ".51, ".52, ".48, ".51, *".77, ".52, ".58, ".53, ".56, ".52.

Elongation of pin-holes, A ".19, B "20.

Area at fracture, 4".80 × 1".09 = 5.23 square inches.

Contraction, 9.8 per cent.

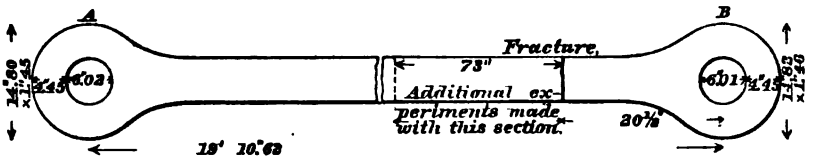
Fractured 62" from center of pin-hole B.

Appearance, granular, 30 per cent.; fibrous, 70 per cent.

When fractured ends are brought together they closed at the fibrous edge, leaving an opening of ".15 at the granular edge.

Between the point of rupture and head B ragged cracks were developed, seven in number, on one face, at regular intervals of about 7½" apart. On the other face of the stem at this end, also on both faces of the longer fractured end, similar cracks were developed.

No 767.



Sectional area of stem, 8.71 square inches.
Gauged length, 180″.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
8,710	1,000	0.	0.	0.	Initial load.
43,550	5,000	.0254	.0006	.....	
87,100	10,000	.0574	.0012	.....	E = 28,800,000.
130,650	15,000	.0925	.0049	.....	
156,780	18,000	.1225	.0157	.....	
168,000	.....	.1360	.0348	.....	
172,000	19,750	.1420	.....	.....	Elastic limit.
174,200	20,000	.1535	.....	.....	
176,000	.....	.1752	.....	.....	
178,000	.....	.1890	.....	.....	
180,000	.....	.2035	.....	.....	
182,910	21,000	.2250	.....	.40	
186,000	.....	.25	.....	.....	
191,620	22,000	.30	.....	.53	
200,330	23,000	.....	.....	.82	
209,040	24,000	.....	.....	1.36	
217,750	25,000	.....	.....	1.66	
226,460	26,000	.....	.....	2.12	
235,170	27,000	.....	.....	2.71	
243,880	28,000	.....	.....	3.30	
252,590	29,000	.....	.....	4.05	
261,300	30,000	.....	.....	4.75	
270,010	31,000	.....	.....	5.60	
278,720	32,000	.....	.....	6.45	
287,430	33,000	.....	.....	7.36	
296,140	34,000	.....	.....	8.32	
304,850	35,000	.....	.....	9.41	
313,560	36,000	.....	.....	10.70	
322,270	37,000	.....	.....	12.02	
330,980	38,000	.....	.....	13.41	
339,690	39,000	.....	.....	15.20	Set.
348,400	40,000	.....	.....	17.30	16″.80.
0	0	.....	.....	.....	Rested 5 minutes.
357,110	.....	.....	.....	20.10	
365,820	.....	.....	.....	23.35	
374,530	.....	.....	.....	27.70	
376,800	.....	.....	.....	29.65	Tensile strength.
0	0	21.69	.....	.....	= 12.05 per cent.
0	0	.....	.....	28.86	= 12.09 per cent.

Elongation of 10-inch sections, 1″.02, 1″.38, 1″.53, 1″.23, 1″.08 1″.08, 1″.02, 1″.03, 1″.15, 1″.12, 1″.08, 1″.09, 1″.11, 1″.16, 1″.08, 1″.15, 1″.21, 1″.33, 1″.60, 1″.64, 2″.17, *1″.21.

Elongation of pin-holes, A ″.62, B ″.56.

Fractured 20½″ from center of pin-hole B.

Appearance, granular, 80 per cent.; fibrous, 20 per cent. Started cracks in neck and sides of pin-hole head A.

Area of fracture, 5″.58 × 1″.28 = 7.14 square inches.

Contraction, 18.0 per cent.

Area 2½″ from point of rupture, 5″.37 × 1″22 = 6.55 square inches.

Contraction, 24.8 per cent.

Gauged length, 178″.45; includes sixteen of the original 10-inch sections, beginning at end A of the original gauged length.

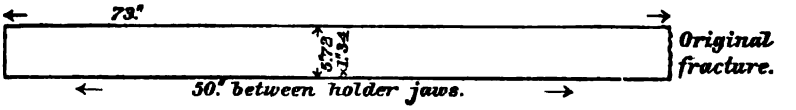
Sectional area called 7.809 square inches.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
8,710	1,115	0.	0.	0.	Initial load. Micrometer reset.
43,550	5,577	.0307	.0307	.....	
87,100	11,153	.0680	.0373	.....	
130,650	16,730	.1056	.0376	.....	
174,200	22,306	.1452	.0396	.....	
217,750	27,883	.1855	.0403	.....	
174,200	22,306	.1491	.0364	.....	
130,650	16,730	.1118	.0373	.....	
87,100	11,153	.0740	.0378	.....	
43,550	5,577	.0354	.0386	.....	
8,710	1,115	.0040	.0314	.....	
174,200	22,306	.1462	.1422	.....	Load left on bar over night, 15 hours.
111,000	.....	.0860	.0602	.....	Load on bar after 15 hours' rest.
174,200	22,306	.1387	.0527	.....	
130,650	16,730	.1026	.0361	.....	
87,100	11,153	.0661	.0365	.....	
43,550	5,577	.0294	.0367	.....	
8,710	1,115	—.0006	.0300	.....	
43,550	5,577	.0285	.0291	.....	
87,100	11,153	.0653	.0368	.....	
130,650	16,730	.1022	.0369	.....	
174,200	22,306	.1390	.0368	.....	
130,650	16,730	.1028	.0362	.....	
87,100	11,153	.0665	.0363	.....	
43,550	5,577	.0297	.0368	.....	
8,710	1,115	.0001	.0296	.....	
43,550	5,577	.0292	.0291	.....	
87,100	11,153	.0659	.0367	.....	
130,650	16,730	.1026	.0367	.....	
174,200	22,306	.1396	.0370	.....	
130,650	16,730	.1032	.0364	.....	
87,100	11,153	.0669	.0363	.....	
43,550	5,577	.0300	.0369	.....	
8,710	1,115	.0003	.0297	.....	
43,550	5,577	.0295	.0292	.....	
87,100	11,153	.0664	.0369	.....	
130,650	16,730	.1032	.0368	.....	
174,200	22,306	.1401	.0369	.....	
217,750	28,883	.1769	.0368	.....	
261,300	34,459	.2139	.0370	.....	
304,850	40,036	.2512	.0373	.....	
261,300	34,459	.2147	.0365	.....	
217,750	28,883	.1780	.0367	.....	
174,200	22,306	.1418	.0362	.....	
130,650	16,730	.1052	.0366	.....	
87,100	11,153	.0684	.0368	.....	
43,550	5,577	.0313	.0371	.....	
8,710	1,115	.0010	.0303	.....	
43,550	5,577	.0303	.0293	.....	
87,100	11,153	.0671	.0368	.....	
130,650	16,730	.1040	.0369	.....	
174,200	22,306	.1411	.0371	.....	

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Successive elongation.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	
130,650	16,730	.1046	.0365	.....	
87,100	11,153	.0681	.0365	.....	
43,550	5,576	.0313	.0368	.....	
8,710	1,115	.0012	.0301	.....	
Test resumed after an additional rest of 47 hours.					
8,710	1,115	0.	0.	0.	Initial load. Micrometer reset.
43,550	5,577	.0305	.0305	.....	
87,100	11,153	.0671	.0366	.....	
130,650	16,730	.1036	.0365	.....	
174,200	22,306	.1406	.0370	.....	
130,650	16,730	.1045	.0361	.....	
87,100	11,153	.0684	.0361	.....	
43,550	5,577	.0319	.0365	.....	
8,710	1,115	.0021	.0298	.....	
43,550	5,577	.0315	.0294	.....	
87,100	11,153	.0681	.0366	.....	
130,650	16,730	.1048	.0367	.....	
174,200	22,306	.1415	.0367	.....	
217,750	28,883	.1781	.0366	.....	
261,300	34,459	.2151	.0370	.....	
304,850	40,036	.2527	.0376	.....	
261,300	34,459	.2166	.0361	.....	
217,750	28,883	.1802	.0364	.....	
174,200	22,306	.1440	.0362	.....	
130,650	16,730	.1074	.0366	.....	
87,100	11,153	.0711	.0363	.....	
43,550	5,577	.0341	.0370	.....	
8,710	1,115	.0040	.0301	.....	Test discontinued.

TEST BY TENSILE AND COMPRESSIVE STRESSES OF A SECTION OF FRACTURED WROUGHT-IRON EYE-BAR, NO. 767.

[Reloaded after an interval of 104 days.]



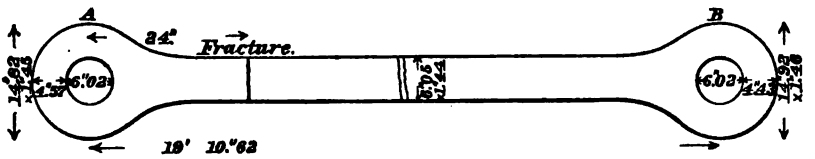
Sectional area (approximate), 7.66 square inches.
Gauged length, 30″.

Applied loads.		In gauged length.				Remarks.
Total.	Per square inch.	Elongation.	Set.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
7, 660	1, 000	0.	0.	.....	.....	Initial load
38, 300	5, 000	.0043	.....	.....	.....	
76, 600	10, 000	.0098	.....	.....	.....	
114, 900	15, 000	.0153	.....	.....	.....	
153, 200	20, 000	.0208	.....	.....	.....	
191, 500	25, 000	.0265	.....	.....	.....	
229, 800	30, 000	.0318	.....	.....	.....	
191, 500	25, 000	.0265	.....	.....	.....	
153, 200	20, 000	.0210	.....	.....	.....	
114, 900	15, 000	.0155	.....	.....	.....	
76, 600	10, 000	.0102	.....	.....	.....	
38, 300	5, 000	.0046	.....	.....	.....	
7, 660	1, 000	.0008	.0008	.....	.....	
7, 660	1, 000	.....	.....	0.	0.	Initial load.
38, 300	5, 000	.....	.....	.0041	.....	
76, 600	10, 000	.....	.....	.0094	.....	
114, 900	15, 000	.....	.....	.0147	.....	
153, 200	20, 000	.....	.....	.0199	.....	
191, 500	25, 000	.....	.....	.0252	.....	
153, 200	20, 000	.....	.....	.0201	.....	
114, 900	15, 000	.....	.....	.0150	.....	
76, 600	10, 000	.....	.....	.0097	.....	
38, 300	5, 000	.....	.....	.0046	.....	
7, 660	1, 000	.....	.....	.0002	.....	
7, 660	1, 000	0.	0.	.....	.....	Initial load.
38, 300	5, 000	.0043	.....	.....	.....	
76, 600	10, 000	.0098	.....	.....	.....	
114, 900	15, 000	.0152	.....	.....	.....	
153, 200	20, 000	.0207	.....	.....	.....	
191, 500	25, 000	.0262	.....	.....	.....	
153, 200	30, 000	.0318	.....	.....	.....	
191, 500	25, 000	.0264	.....	.....	.....	
229, 800	20, 000	.0210	.....	.....	.....	
114, 900	15, 000	.0154	.....	.....	.....	
76, 600	10, 000	.0100	.....	.....	.....	
38, 300	5, 000	.0048	.....	.....	.....	
7, 660	1, 000	.0002	.....	.....	.....	
7, 660	1, 000	.....	.....	0.	0.	Initial load.
38, 300	5, 000	.....	.....	.0042	.....	
76, 600	10, 000	.....	.....	.0094	.....	
114, 900	15, 000	.....	.....	.0147	.....	
153, 200	20, 000	.....	.....	.0198	.....	
191, 500	25, 000	.....	.....	.0248	.....	
153, 200	20, 000	.....	.....	.0198	.....	
114, 900	15, 000	.....	.....	.0147	.....	
76, 600	10, 000	.....	.....	.0096	.....	
38, 300	5, 000	.....	.....	.0043	.....	
7, 660	1, 000	.....	.....	.0002	.....	
7, 660	1, 000	0.	0.	.....	.....	Initial load.
229, 800	30, 000	.0320	.....	.....	.....	
268, 100	35, 000	.0375	.....	.....	.....	
306, 400	40, 000	.0432	.....	.....	.....	
268, 100	35, 000	.0377	.....	.....	.....	
229, 800	30, 000	.0320	.....	.....	.....	
191, 500	25, 000	.0270	.....	.....	.....	
153, 200	20, 000	.0215	.....	.....	.....	
114, 900	15, 000	.0160	.....	.....	.....	
76, 600	10, 000	.0105	.....	.....	.....	
38, 300	5, 000	.0050	.....	.....	.....	
7, 660	1, 000	.0005	.....	.....	.....	

Applied loads.		In gauged length.				Remarks.
Total.	Per square inch.	Elongation.	Set.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
7,660	1,000	.....	.....	0.	0.	Initial load.
38,300	5,000	.....	.....	.0043	.....	
76,600	10,000	.....	.....	.0097	.....	
114,000	15,000	.....	.....	.0150	.....	
153,200	20,000	.....	.....	.0203	.....	
191,500	25,000	.....	.....	.0255	.....	
229,800	30,000	.....	.....	.0294	.....	
191,500	25,000	.....	.....	.0248	.....	
153,200	20,000	.....	.....	.0202	.....	
114,900	15,000	.....	.....	.0154	.....	
76,600	10,000	.....	.....	.0105	.....	
38,300	5,000	.....	.....	.0154	.....	
7,660	1,000	.....	.....	.0013	.....	

NOTE.—Under compression stresses the bar deflected upwards, the micrometer being on the convex side.

No. 768.



Sectional area of stem, 8.71 square inches.
Gauged length, 180″.
Stem of bar curved perpendicular to plane of pins. V. sine $\frac{1}{4}$″.

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
8,710	1,000	0.	0.	0.	Initial load.
43,550	5,000	.0263	.0003	.....	
87,100	10,000	.0590	.0008	.....	E=28,301,000.
130,650	15,000	.0937	.0030	.....	
156,780	18,000	.1170	.0075	.....	
158,000	.....	.1194	.....	.....	
160,000	.....	.1215	.....	.....	
162,000	.....	.1235	.....	.....	
164,000	.....	.1252	.....	.....	
166,000	.....	.1274	.....	.....	
168,000	.....	.1294	.....	.....	
170,000	.....	.1319	.....	.....	
172,000	.....	.1340	.....	.....	
174,200	20,000	.1368	.0150	.27	Set, .05.
176,000	.....	.1401	.....	.....	
178,000	.....	.1447	.....	.....	Rested 3 minutes.
180,000	.....	.1463	.....	.....	
182,000	.....	.1497	.....	.....	
184,000	.....	.1512	.....	.....	
186,000	.....	.1527	.....	.....	
188,000	.....	.1547	.....	.....	
190,000	.....	.1573	.....	.....	
192,000	.....	.1595	.....	.....	
194,000	.....	.1623	.....	.....	
196,000	.....	.1661	.....	.....	
198,000	22,730	.1712	.....	.....	Elastic limit.
200,000	.....	.1810	.....	.....	
202,000	.....	.1885	.....	.....	
204,000	.....	.1960	.....	.....	
206,000	.....	.2055	.....	.....	
8,710	.....	.....	.....	.....	Rested 1 hour.
208,000	.....	.2108	.....	.....	

Applied loads.		In gauged length.		Elongation (center to center of pins).	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds	*Pounds.*	*Inches.*	*Inch.*	*Inches.*	
209,040	24,000	.2267	.....	.....	
210,000	.....	.2296	.....	.....	
212,000	.....	.2478	.....	.....	
217,750	25,000	.29	.....	.57	
226,460	26,000	.....	.....	.69	
235,170	27,000	.....	.....	1.00	
243,880	28,000	.....	.....	1.70	
252,590	29,000	.....	.....	2.24	
261,300	30,000	.....	.....	2.75	
270,010	31,000	.....	.....	3.36	
278,720	32,000	.....	.....	4.00	
287,430	33,000	.....	.....	4.75	Sharp, snapping sound.
296,140	34,000	.....	.....	5.58	
304,850	35,000	.....	.....	6.52	
313,560	36,000	.....	.....	7.41	Snapping sounds continued at intervals.
322,270	37,000	.....	.....	8.54	
330,980	38,000	.....	.....	9.70	
339,690	39,000	.....	.....	11.07	
348,400	40,000	.....	.....	12.50	
357,110	41,000	.....	.....	14.10	
365,820	42,000	.....	.....	.....	
366,000	42,020	.....	.....	.....	Tensile strength.
0	0	11.77	.....	.....	=6.5 per cent.
0	0	.....	.....	15.81	=6.6 per cent.

Elongation of 10-inch sections, ″.70, *1″.29, ″.76, ″.76, ″.70, ″.66, ″.63, ″ 64, ″.63, ″.60, ″.61, ″.62, ″.68, ″.63, ″.61, ″.60, ″.60, ″.65, ″.70, ″.69, ″.72, ″57.

Elongation of pin-holes, A ″.45, B ″.29.

Area at fracture, 5″.68×1″.24=7.04 square inches.

Contraction, 19.2 per cent.

Fractured 24″ from center of pin-hole A. Appearance, granular at one edge, 5 per cent. fibrous for the balance of the fracture, with slight granulation in this section.

Seams showing imperfect welding in the rolling. Seven distinct layers of metal displayed.

Opened small granular cracks in neck of head B.

TABULATION OF TENSILE TESTS OF STEEL AND WROUGHT-IRON EYE-BARS.

No. of test.	Kind of metal.	Dimensions.			Sectional area.	Elastic limit per square inch.	Tensile strength.		Elongation.		Contraction of area.	Modulus of elasticity per square inch.	Maximum compression on pin-holes per square inch.	Fracture.	
		Length (center to center of pin-holes).	Width.	Thickness.			Total.	Per square inch.	In gauged length.	Center to center of pin-holes.				Location.	Appearance.
		Inches.	*Inches.*	*Inches.*	*Sq. inches.*	*Pounds.*	*Pounds*	*Pounds.*	*Per ct.*	*Per ct.*	*Per ct.*	*Pounds.*	*Pounds.*		
4134	Steel	308.00	5.16	1.02	5.26	34,610	341,200	64,870	7.4	7.3	.....	31,400,900	74,173	.....	
4135	....do	308.00	5.14	1.02	5.24	34,730	3.3,300	69,230	10.4	10.3	.....	29,279,000	81,093	.....	
4136	....do	308.00	5.15	1.02	5.25	37,330	369,000	70,286	11.7	11.5	.....	29,017,000	80,043	.....	
4137	....do	308.10	5.14	1.02	5.24	35,000	368,000	70,229	11.6	11.4	13.4	.....	79,826	Stem ...	Granular, radiating from a button of hard metal.
4138	....do	308.00	5.13	1.02	5.23	35,950	374,900	71,680	11.8	11.5	.....	.....	81,323	.....	
4139	....do	307.95	5.15	1.02	5.25	35,000	372,200	70,895	12.1	11.8	.....	30,162,000	80,737	.....	
763	Wrought iron	238.55	5.00	1.14	5.70	22,456	257,100	45,105	11.7	11.6	31.2	28,037,000	52,763	Stem ...	Fibrous traces of granulation.
764	....do	238.60	5.00	1.15	5.75	22,610	256,100	44,540	9.4	9.4	29.6	28,125,000	50,588	...do	Fibrous, 70 per cent.; granular, 30 per cent.
765	....do	238.57	4.99	1.14	5.69	21,790	246,500	43,320	7.8	8.0	26.4	27,950,000	48,492	...do	Do.
766	....do	238.64	5.00	1.16	5.80	22,410	229,400	39,550	5.1	4.8	9.8	27,355,000	45,013	...do	Do.
767	....do	238.62	6.05	1.44	8.71	19,750	376,800	43,260	12.05	12.09	24.8	28,800,000	43,166	.. do	Granular, 80 per cent.; fibrous, 20 per cent.
768	....do	238.62	6.05	1.44	8.71	22,730	366,060	42,020	6.5	6.6	10.2	28,301,000	41,929	...do	Granular 5 per cent. at one edge, fibrous for balance of fracture.

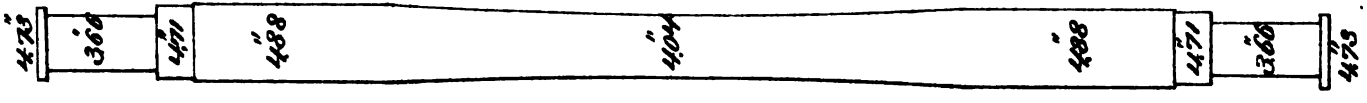
The gauged length of the steel eye-bars was 260″. The moduli of elasticity computed between 25,000 and 30,000 pounds per square inch.
The gauged length of the wrought-iron eye-bars was 180″. The moduli of elasticity computed between 5,000 and 10,000 pounds per square inch.

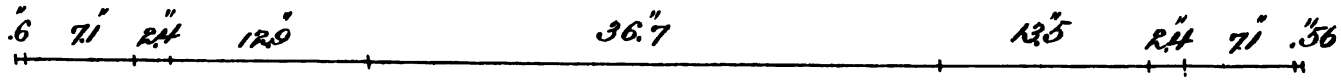
WROUGHT-IRON RAILWAY AXLE.

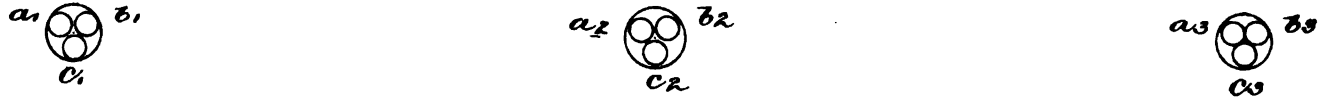
CONTINUATION OF TESTS.

SEE REPORT, 1885.

Muck bar axle No. 4.







Specimens from muck-bar axle No. 4 after the axle had run 163,138 miles.

Comparing these results with earlier tests of this series, the tensile strength of the metal in this axle is lower and the modulus of elasticity less than shown by the preceding axles.

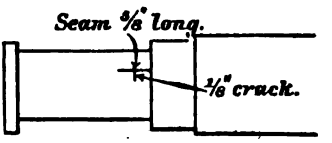
The variations in strength, elasticity, and ductility are no greater, however, than those met in different specimens of new iron of nominally the same grade, and while apparently there is a deterioration in quality, it needs confirmation of a more decisive nature from the remaining axles before attributing this result to the influence of the work done in service.

Specimens Nos. 805, 806, and 807 all fractured at about the same distance from the end of the axle, or nearly opposite the shoulder at the inside end of the journal-bearing.

In the vicinity of these fractures the fibers of the metal converge from the larger diameter of the axle and were oblique to the axes of the test specimens.

The fracture of specimen No. 806 followed the direction of the fiber a distance of $1\frac{1}{2}''$, the balance of the fracture being across fibrous metal.

In rough-turning this specimen a small crack opened from a seam located in the axle at the place shown by this sketch:



Lengthwise the axle the seam extended $\frac{5}{8}''$; at right angles to it the crack opened $\frac{1}{8}''$ long.

About four weeks intervened between the time the axle was taken from the tender truck, where it was run, and the time of testing the specimens.

The disturbance in the modulus of elasticity by overstraining the metal, investigated more at length with steel and wrought-iron eye-bars, is here shown by bar No. 813 after having been loaded with 34,000 pounds per square inch tension.

No. 805.

Marks, $\frac{MB_4}{a_1}$
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0014	0.	
10,000	10,000	.0032	.0001	
15,000	15,000	.0051	.0001	
20,000	20,000	.0080	.0011	Elastic limit.
20,500	20,500	.0095	.....	
21,000	21,000	.0177	.....	
21,500	21,500	.0251	.....	
22,000	22,000	.0290	.....	
22,500	22,500	.0370	.....	
23,000	23,000	.0448	.....	
23,500	23,500	.0507	.....	
24,000	24,000	.0630	.....	
24,500	24,500	.0750	.....	
25,000	25,000	.0904	.0813	
5,000	5,000	.0827	.....	
10,000	10,000	.0846	.....	
15,000	15,000	.0864	.....	
20,000	20,000	.0884	.0813	
26,000	26,000	.1103	.....	
27,000	27,000	.1375	.....	
28,000	28,000	.1674	.....	
29,000	29,000	.19	.....	
30,000	30,000	.21	.....	
31,000	31,000	.24	.....	
32,000	32,000	.29	.....	
33,000	33,000	.32	.....	
34,000	34,000	.36	.....	
35,000	35,000	.43	.....	
36,000	36,000	.47	.....	
37,000	37,000	.51	.....	
38,000	38,000	.59	.....	
39,000	39,000	.66	.....	
40,000	40,000	.74	.....	
41,000	41,000	.83	.....	
42,000	42,000	.92	.....	
43,000	43,000	1.11	.....	
44,000	44,000	1.32	.....	
45,000	45,000	1.60	.....	
45,420	45,420	2.00	.....	Tensile strength.
36,000	36,000	.....	.....	Load at time of fracture.
0	0	2.31	.....	=23.1 per cent.

Elongation of inch sections, ″.38, *″.54, ″.23, ″.19, ″.18, ″.17, ″.15, ″.16, ″.15, ″.16.

Diameter at fracture, ″.84. Area, .554 square inch.

Contraction, 44.6 per cent.

Fractured 3″ from neck or 6½″ from end of axle. Appearance, fibrous, seamy.

No. 806.

Marks, $\frac{MB_4}{b_1}$
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0014	0.	
10,000	10,000	.0029	0.	
15,000	15,000	.0049	.0002	
18,000	18,000	.0065	.....	
18,500	18,500	.0068	.....	
19,000	19,000	.0072	.....	
19,500	19,500	.0078	.....	Elastic limit.
20,000	20,000	.0097	.0029	
20,500	20,500	.0120	.....	
21,000	21,000	.0155	.....	
21,500	21,500	.0177	.....	
22,000	22,000	.0215	.....	
23,000	23,000	.0329	.....	
24,000	24,000	.0458	.....	
25,000	25,000	.0687	.....	
26,000	26,000	.0881	.....	
27,000	27,000	.1135	.....	
28,000	28,000	.1436	.....	
29,000	29,000	.1680	.....	
30,000	30,000	.1975	.....	
31,000	31,000	.23	.....	
32,000	32,000	.27	.....	
33,000	33,000	.31	.....	
34,000	34,000	.37	.....	
35,000	35,000	.40	.....	
36,000	36,000	.46	.....	
37,000	37,000	.50	.....	
38,000	38,000	.58	.....	
39,000	39,000	.64	.....	
40,000	40,000	.73	.....	
41,000	41,000	.83	.....	
42,000	42,000	.99	.....	
43,000	43,000	1.17	.....	
43,310	43,310	1.30	.....	Tensile strength.
33,000	.....	.....	.....	Load at time of fracture.
0	0	1.67	.....	=16.7 per cent.

Elongation of inch sections, ″.16, *″.55, ″.17, ″.12, ″.12, ″.12, ″.11, ″.09, ″.11.

Diameter of fracture, ″.87. Area, ″.594.

Contraction, 40.6 per cent.

Fractured 3″ from neck or 6½″ from end of axle. Appearance fibrous, followed a seam 1½″.

No. 807.

Marks, $\frac{MB_4}{O_1}$
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0014	0.	
10,000	10,000	.0030	0.	
15,000	15,000	.0049	0.	
18,000	18,000	.0060	.....	
18,500	18,500	.0062	.....	
19,000	19,000	.0064	.....	
19,500	19,500	.0070	.....	
20,000	20,000	.0075	.....	Elastic limit.
20,500	20,500	.0089	.....	
21,000	21,000	.0135	.....	
21,500	21,500	.0190	.....	
22,000	22,000	.0251	.....	
23,000	23,000	.0374	.....	
24,000	24,000	.0487	.....	
25,000	25,000	.0675	.....	
26,000	26,000	.0940	.....	
27,000	27,000	.1170	.....	
28,000	28,000	.1475	.....	
29,000	29,000	.1720	.....	
30,000	30,000	.2050	.....	
31,000	31,000	.25	.....	
32,000	32,000	.29	.....	
33,000	33,000	.32	.....	
34,000	34,000	.36	.....	
35,000	35,000	.41	.....	
36,000	36,000	.47	.....	
37,000	37,000	.51	.....	
38,000	38,000	.58	.....	
39,000	39,000	.65	.....	
40,000	40,000	.72	.....	
41,000	41,000	.81	.....	
42,000	42,000	.92	.....	
43,000	43,000	1.07	.....	
44,000	44,000	1.24	.....	
45,000	45,000	1.51	.....	
45,290	45,290	1.74	.....	Tensile strength.
37,000	37,000	.....	.....	Load at time of fracture.
0	0	2.18	.....	=21.8 per cent.

Elongation of inch sections, ″.27, ″.62,* ″.25, ″.19, ″.16, ″.14, ″.14, ″.15, ″.14, ″.12.
Diameter at fracture, ″.85. Area, .567 square inch.
Contraction, 43.3 per cent.
Fractured $3\frac{1}{4}$″ from neck or $6\frac{3}{4}$″ inch from end of axle.
Appearance, fibrous. Considerable cinder present.

No. 808.

Marks, $\frac{MB_4}{a_2}$
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	0.	
10,000	10,000	.0032	.0001	
15,000	15,000	.0051	.0001	
18,000	18,000	.0061	.0002	
18,500	18,500	.0063	.....	
19,000	19,000	.0067	.....	
19,500	19,500	.0069	.....	
20,000	20,000	.0071	.0004	
20,500	20,500	.0073	.....	
21,000	21,000	.0076	.....	
21,500	21,500	.0078	.....	
22,000	22,000	.0081	.....	
22,500	22,500	.0083	.....	
23,000	23,000	.0089	.....	
23,500	23,500	.0092	.....	
24,000	24,000	.0097	.....	
24,500	24,500	.0103	.....	
25,000	25,000	.0109	.0024	Elastic limit
25,500	25,500	.0155	.....	
26,000	26,000	.0230	.....	
26,500	26,500	.0322	.....	
27,000	27,000	.0412	.....	
27,500	27,500	.0480	.....	
28,000	28,000	.0565	.....	
29,000	29,000	.0760	.....	
30,000	30,000	.1092	.....	
31,000	31,000	.1340	.....	
32,000	32,000	.1650	.....	
33,000	33,000	.2000	.....	
34,000	34,000	.2310	.....	
35,000	35,000	.2820	.2682	
.....	1,000	.2682	.....	
.....	5,000	.2698	.....	
.....	10,000	.2717	.....	
.....	15,000	.2738	.....	
.....	20,000	.2758	.....	
.....	25,000	.2780	.....	
.....	30,000	.2802	.....	
.....	25,000	.2784	.....	
.....	20,000	.2764	.....	
.....	15,000	.2745	.....	
.....	10,000	.2723	.....	
.....	5,000	.2702	.....	
.....	1,000	.2684	.....	
36,000	36,000	.3050	.....	
37,000	37,000	.3640	.....	
38,000	38,000	.42	.....	
39,000	39,000	.50	.....	
40,000	40,000	.58	.....	
41,000	41,000	.64	.....	
42,000	42,000	.72	.....	
43,000	43,000	.87	.....	
44,000	44,000	.99	.....	
45,000	45,000	1.18	.....	
46,000	46,000	1.50	.....	
46,440	46,440	2.00	.....	Tensile strength.
40,500	.....	.....	.....	Load at time of fracture.
0	0	2.41	.....	=24.1 per cent.

Elongation of inch sections, ″.17, ″.19, ″.30, *″.58, ″.26, ″.23, ″.19, ″.15, ″.18, ″.16.
Diameter at fracture, ″.81.
Area, .515 square inch.
Contraction, 48.5 per cent.
Fractured, 5″.4 from neck. Appearance, fibrous.

No. 809.

Marks, $\frac{MB_4}{b_2}$
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0014	0.	
10,000	10,000	.0032	0.	
15,000	15,000	.0050	0.	
18,000	18,000	.0060	0.	
20,000	20,000	.0067	0.	
20,500	20,500	.0069	.....	
21,000	21,000	.0071	.....	
21,500	21,500	.0073	.....	
22,000	22,000	.0076	.....	
22,500	22,500	.0078	.....	
23,000	23,000	.0082	.....	
23,500	23,500	.0085	.....	
24,000	24,000	.0090	.....	
24,500	24,500	.0098	.....	Elastic limit.
25,000	25,000	.0122	.0038	
25,500	25,500	.0235	.....	
26,000	26,000	.0410	.....	
26,500	26,500	.0490	.....	
27,000	27,000	.0595	.....	
27,500	27,500	.0692	.....	
28,000	28,000	.0796	.....	
29,000	29,000	.1020	.....	
30,000	30,000	.1245	.....	
31,000	31,000	.1550	.....	
32,000	32,000	.1865	.....	
33,000	33,000	.2210	.....	
34,000	34,000	.2640	.....	
35,000	35,000	.3000	.....	
36,000	36,000	.3530	.....	
37,000	37,000	.39	.....	
38,000	38,000	.47	.....	
39,000	39,000	.53	.....	
40,000	40,000	.60	.....	
41,000	41,000	.68	.....	
42,000	42,000	.80	.....	
43,000	43,000	.96	.....	
44,000	44,000	1.11	.....	
45,000	45,000	1.29	.....	
46,000	46,000	1.72	.....	
46,100	46,100	2.05	.....	Tensile strength.
38,800	.....	.....	.....	Load at time of rupture.
0	0	2.53	.....	= 25.3 per cent.

Elongation of inch sections, ″.17, ″.18, ″.24, *″.63, ″.34, ″.23, ″.22, ″.18, ″.17, ″.17.
Diameter at fracture, .″79. Area, .49 square inch.
Contraction, 51.0 per cent.
Fractured 5″.85 from neck. Appearance, fibrous.

No. 810.

Marks, $\frac{MB_4}{C_2}$
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0014	0.	
10,000	10,000	.0032	0.	
15,000	15,000	.0050	.0001	
18,000	18,000	.0061	.0001	
20,000	20,000	.0067	.0001	
20,500	20,500	.0069	.....	
21,000	21,000	.0071	.....	
21,500	21,500	.0073	.....	
22,000	22,000	.0075	.....	
22,500	22,500	.0077	.....	
23,000	23,000	.0078	.....	
23,500	23,500	.0080	.....	
24,000	24,000	.0082	.....	
24,500	24,500	.0081	.....	
25,000	25,000	.0087	.0003	
25,500	25,500	.0089	.....	
26,000	26,000	.0092	.....	
26,500	26,500	.0094	.....	Elastic limit.
27,000	27,000	.0102	.....	
		.0170	.....	
27,500	27,500	.0257	.....	
28,000	28,000	.0354	.....	
29,000	29,000	.0440	.....	
30,000	30,000	.0630	.....	
31,000	31,000	.0820	.....	
32,000	32,000	.1090	.....	
33,000	33,000	.1385	.....	
34,000	34,000	.1720	.....	
35,000	35,000	.2090	.....	
36,000	36,000	.2480	.....	
37,000	37,000	.2900	.....	
38,000	38,000	.34	.....	
39,000	39,000	.40	.....	
40,000	40,000	.48	.....	
41,000	41,000	.53	.....	
42,000	42,000	.60	.....	
43,000	43,000	.70	.....	
44,000	44,000	.80	.....	
45,000	45,000	.93	.....	
46,000	46,000	1.12	.....	
47,000	47,000	1.36	.....	
47,730	47,730	1.84	.....	Tensile strength.
41,600	.....	.....	.....	Load at time of rupture.
0	0	2.20	.....	=22.9 per cent.

Elongation of inch sections, ″.21, ″.22, ″.35, *″.56, ″.23, ″.19, ″.16, ″.13, ″.13, ″.11.
Diameter at fracture, ″.83. Area, .541 square inch.
Contraction, 45.9 per cent.
Fractured 5″.25 from neck. Appearance, fibrous.

No. 811.

Marks, $\frac{MB_4}{s_2}$
Diameter, 1″.129.
Sectional area 1.00 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0014	0.	
10,000	10,000	.0042	0.	
15,000	15,000	.0049	0.	
18,000	18,000	.0059	0.	
18,500	18,500	.0062	.....	
19,000	19,000	.0064	.....	
19,500	19,500	.0067	.....	
20,000	20,000	.0069	.0003	
20,500	20,500	.0072	.....	
21,000	21,000	.0075	.....	Elastic limit.
21,500	21,500	.0085	.....	
22,000	22,000	.0099	.....	
22,500	22,500	.0112	.....	
23,000	23,000	.0158	.....	
23,500	23,500	.0235	.....	
24,000	24,000	.0328	.....	
25,000	25,000	.0560	.....	
26,000	26,000	.0745	.....	
27,000	27,000	.1040	.....	
28,000	28,000	.1300	.....	
29,000	29,000	.1575	.....	
30,000	30,000	.1900	.....	
31,000	31,000	.2230	.....	
32,000	32,000	.2540	.....	
33,000	33,000	.2930	.....	
34,000	34,000	.3360	.....	
35,000	35,000	.39	.....	
36,000	36,000	.46	.....	
37,000	37,000	.50	.....	
38,000	38,000	.57	.....	
39,000	39,000	.63	.....	
40,000	40,000	.70	.....	
41,000	41,000	.80	.....	
42,000	42,000	.91	.....	
43,000	43,000	1.05	.....	
44,000	44,000	1.25	.....	
45,000	45,000	1.59	.....	
45,370	45,370	1.92	.....	Tensile strength.
0	0	2.20	.....	=22.0 per cent.

Elongation of inch sections, ″.17, ″.16, ″.18, ″.24, ″.43,* ″.25, ″.24, ″.16, ″.18, ″.19.

Diameter at fracture, ″.95. Area, .709 square inch.

Contraction, 29.1 per cent.

Fractured 1½″ from middle of stem or 11⅜″ from end of axle. Appearance, fibrous.

No. 812.

Marks, $\frac{MB_4}{b_2}$
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0014	0.	
10,000	10,000	.0031	.0001	
15,000	15,000	.0049	.0001	
18,000	18,000	.0058	.0001	
18,500	18,500	.0061	.....	
19,000	19,000	.0064	.....	
19,500	19,500	.0067	.....	
20,000	20,000	.0070 .0077	.0006	Elastic limit.
20,500	20,500	.0082	.....	
21,000	21,000	.0107	.....	
21,500	21,500	.0174	.....	
22,000	22,000	.0225	.....	
22,500	22,500	.0290	.....	
23,000	23,000	.0378	.....	
24,000	24,000	.0650	.....	
25,000	25,000	.0900	.....	
26,000	26,000	.1146	.....	
27,000	27,000	.1405	.....	
28,000	28,000	.1650	.....	
29,000	29,000	.1960	.....	
30,000	30,000	.2250	.....	
31,000	31,000	.2600	.....	
32,000	32,000	.2930	.....	
33,000	33,000	.3280	.....	
34,000	34,000	.37	.....	
35,000	35,000	.42	.....	
36,000	36,000	.48	.....	
37,000	37,000	.53	.....	
38,000	38,000	.59	.....	
39,000	39,000	.66	.....	
40,000	40,000	.74	.....	
41,000	41,000	.84	.....	
42,000	42,000	.98	.....	
43,000	43,000	1.12	.....	
44,000	44,000	1.40	.....	
44,050	44,050	1.50	.....	Tensile strength.
35,100	.....	.....	.....	Load at time of fracture.
0	0	1.88	.....	= 18.8 per cent.

Elongation of inch sections, ″.14, ″.14, ″.13, ″.13, ″.15, ″.13, ″.21, ″.53, ″.17, ″.15.
Diameter at fracture, ″.84. Area, .554 square inch.
Contraction, 44.6 per cent.
Fractured 4″.4 from neck, or 7½″ from end of axle.
Appearance, fibrous, seamy.

No. 813.

arks, $\frac{MB_4}{C_2}$
iameter, 1″.129.
ctional area, 1.00 square inch
auged length, 10″.

Applied loads.		In gauged length.		Remarks.
otal.	Per square inch.	Elongation.	Set.	
unds.	*Pounds.*	*Inches.*	*Inch.*	
, 000	1, 000	0.	0.	Initial load.
, 000	5, 000	.0013	0.	
, 000	10, 000	.0030	0.	
, 000	15, 000	.0048	0.	
, 000	18, 000	.0059	0.	
, 500	18, 500	.0061	.....	
, 000	19, 000	.0064	.....	
, 500	19, 500	.0067	.....	
, 000	20, 000	.0069	.0004	
, 500	20, 500	.0073	.....	
, 000	21, 000	.0077	.....	
, 500	21, 500	.0079	.....	Elastic limit.
, 000	22, 000	.0088	.....	
, 500	22, 500	.0096	.....	
, 000	23, 000	.0113	.....	
, 500	23, 500	.0142	.....	
, 000	24, 000	.0200	.....	
, 500	24, 500	.0280	.....	
, 000	25, 000	.0349	.0263	
, 000	26, 000	.0478	.....	
, 000	27, 000	.0737	.....	
, 000	28, 000	.0990	.....	
, 000	29, 000	.1200	.....	
, 000	30, 000	.1558	.....	
, 000	31, 000	.1910	.....	
, 000	32, 000	.2150	.....	
, 000	33, 000	.2495	.....	
, 000	34, 000	.2900	.2782	
		Sectional area called .97293 square inch.		
, 000	1, 078	.2782	.....	
, 000	5, 391	.2798	.....	E = 28, 374, 000.
, 000	10, 782	.2817	.....	E = 26, 955, 000.
, 000	16, 173	.2837	.....	E = 25, 671, 000.
, 000	21, 564	.2858	.....	E = 25, 671, 000.
, 000	26, 955	.2879	.....	E = 23. 439, 000.
, 000	32, 346	.2902	.....	
, 000	26, 955	.2884	.....	E = 29, 950, 000.
, 000	21, 564	.2866	.....	E = 29, 950, 000.
, 000	16, 173	.2846	.....	E = 26, 955, 000.
, 000	10, 782	.2824	.....	E = 24, 504, 000.
, 000	5, 391	.2803	.....	E = 25, 671, 000.
, 000	1, 078	.2783	.....	E = 21, 565, 000.
, 000	35, 000	.32	.....	
, 000	36, 000	.39	.....	
, 000	37, 000	.43	.....	
, 000	38, 000	.49	.....	
, 000	39, 000	.57	.....	
, 000	40, 000	.62	.....	
, 000	41, 000	.69	.....	
, 000	42, 000	.80	.....	
, 000	43, 000	.91	.....	
, 000	44, 000	1.02	.....	
, 000	45, 000	1.22	.....	
, 000	46, 000	1.49	.....	
, 760	46, 760	2.12	.....	Tensile strength.
, 000	.....	.....	.....	Load at time of fracture.
	0	2.41	.....	= 24 1 per cent.

Elongation of inch sections, ″.20, ″.19, ″.21, ″.20, ″.28, *″.44, ″.27, ″.19, ″.20, ″.23.

Diameter at fracture, ″.92. Area, .665 square inch.

Contraction, 33.5 per cent.

Fractured at middle of stem or 11″ from end of axle. Appearance fibrous, 80 per cent.; granular, 20 per cent.; seamy, contains considerable cinder.

COMPLETION OF THE TEST OF AXLE SPECIMEN $\frac{MB}{20}$ *AFTER A REST OF 1 YEAR AND 26 DAYS.*

Following is a synopsis of the first test, the details of which are found in the Report of Tests for 1885, No. 1538:

Tensile strength, 47,120 pounds per square inch. Test discontinued when load had fallen to 44,000 pounds per square inch, with stretching still going on.

Total elongation, 1″.97 = 19.7 per cent.

Elongation of inch sections, *″.44, ″.25, ″.19, ″.18, ″.17, ″.16, ″.15, ″.14, ″.15, ″.14.

Diameter at contracted section, ″.93. Area, .679 square inch.

Contraction, 32.1 per cent.

Completion of test.

Tensile strength, 49,700 pounds = 49,700 pounds per square inch on original section, or 73,200 pounds per square inch on reduced section.

Load at time of fracture, 42,100 pounds.

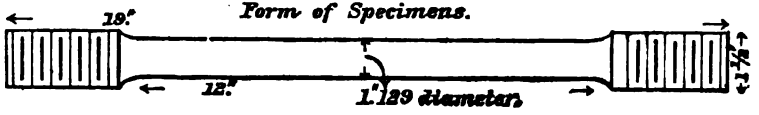
Bar fractured 1″.77 from the neck. The inch section in which fracture occurred elongated from ″.48 to ″.55, the diameter contracting to ″.85 = .567 square inch sectional area, a contraction of 43.3 per cent. from original size.

Other sections of the bar were not elongated any additional amount over the first test.

Appearance of fracture, fibrous.

TABULATION OF TENSILE TESTS OF SPECIMENS FROM MUCK-BAR AXLE NO. 4 AFTER THE AXLE HAD RUN 163,138 *MILES.*

Form of Specimens.



No. of test.	Marks.	Diameter.	Sectional area.	Elastic limit per square inch.	Ultimate strength per square inch.	Elongation in ten inches.	Area at fracture.		Contraction of area.	Appearance of fracture.	Location of fracture.
							Diameter.	Area.			
		Inches.	*Sq. inch.*	*Pounds.*	*Pounds.*	*Per cent.*	*Inch.*	*Sq. inch.*	*Per cent.*		
805	A1	1.129	1.00	20,000	45,420	23.1	.84	.554	44.6	Fibrous; seamy	6½" from end of axle.
806	B1	1.129	1.00	19,500	43,310	16.7	.87	.594	40.6	Fibrous; followed a seam 1½"	Do.
807	C1	1.129	1.00	20,000	45,290	21.8	.85	.567	43.3	Fibrous; considerable cinder present	6¾" from end of axle.
Averages.				19,833	44,673	20.5			42.8		
808	A2	1.129	1.00	25,000	46,440	24.1	.81	.515	48.5	Fibrous	5".4 from neck of specimen.
809	B2	1.129	1.00	24,500	46,100	25.3	.79	.490	51.0	do	5".85 from neck of specimen.
810	C2	1.129	1.00	26,500	47,730	22.9	.83	.541	45.9	do	5".25 from neck of specimen.
Averages.				25,377	46,756	24.1			48.5		
811	A3	1.129	1.00	21,000	45,370	22.0	.95	.709	29.1	Fibrous	11⅜" from end of axle.
812	B3	1.129	1.00	20,000	44,050	18.8	.84	.554	44.6	Fibrous; seamy	7½" from end of axle.
813	C3	1.129	1.00	21,500	46,760	24.1	.92	.665	33.5	Fibrous, 80 per cent.; granular, 20 per cent.; seamy; contains considerable cinder.	11" from end of axle.
Averages.				20,833	45,393	21.6			35.7		

Modulus of elasticity (average of the nine specimens between loads 5,000 and 20,000 pounds per square inch), 28,846,000 pounds.

STEEL BARS.

TEMPERATURE SERIES.

COMPRESSION TESTS OF THE METAL, AND OBSERVATIONS ON THE MODULUS OF ELASTICITY UNDER BOTH TENSILE AND COMPRESSIVE STRESSES

Ten grades of open-hearth steel are here represented, in which the carbon ranges from .09 to .97 per cent., varying by tenths of a per cent. as nearly as was practicable to obtain the steel. The other elements do not follow any regular succession.

The bars were rolled to $1\frac{1}{4}''$ diameter, and turned to specimens from that size.

The steel was made by the Norway Steel and Iron Works, South Boston, Mass., and the chemical analyses furnished by George H. Billings, superintendent.

These bars are intended to furnish part of the material for use in a comprehensive series of tests at higher temperatures.

The compression tests show that bars of the proportions here employed fail by flexure soon after passing the elastic limit of the metal.

The two limits, elastic and ultimate, are very close together in the milder grades of metal, and diverge somewhat in the harder steel.

The modulus of elasticity in compression averages higher than in tension, and appears less regular under the former stress than the latter.

In the case of the tension bars, which afforded the best opportunities for accurate measurements, it is at least evident that the modulus of elasticity is not far from 30,000,000 pounds, whether the steel contains .1 per cent. or 1.00 per cent. of carbon, other elements at the same time being present.

In the details asterisks indicate between what loads the modulus of elasticity was computed.

DETAILS OF COMPRESSION TESTS.

No. 785.

Marks, $\frac{1}{833}$
C., .09. Mn., .11
Length, 12″.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.
4,000	5,000	.0011	0.	*
8,000	10,000	.0029	0.	
12,000	15,000	.0046	0.	
16,000	20,000	.0061	0.	
20,000	25,000	.0078	.0001	
20,800	26,000	.0081	.....	
21,600	27,000	.0085	.....	
22,400	28,000	.0089	.....	
23,200	29,000	.0092	.....	
24,000	30,000	.0095	.0001	* E., 30,120,000.
24,400	30,500	.0097	.....	Elastic limit.
24,800	31,000	.0387	.....	
25,200	31,500	.....	.....	
25,600	32,000	.....	.....	
25,700	32,125	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 786.

Marks, $\frac{2}{123}$
C., .20. Mn., .45.
Length, 12″.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.
4,000	5,000	.0013	0.	*
8,000	10,000	.0029	0.	
12,000	15,000	.0046	0.	
16,000	20,000	.0064	0.	
20,000	25,000	.0080	.0001	
24,000	30,000	.0096	.0002	
24,800	31,000	.0100	.....	
25,600	32,000	.0105	.....	
26,400	33,000	.0108	.....	
27,200	34,000	.0111	.....	
28,000	35,000	.0115	.0003	* E., 30,303,000.
28,800	36,000	.0118	.....	
29,600	37,000	.0123	.....	Elastic limit.
30,000	37,500	.0199	.....	
30,400	38,000	.0308	.....	
31,200	39,000	.0450	.....	
31,350	39,190	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 787.

Marks, $\frac{3}{782}$
C., .31. Mn., .57.
Length, 12″.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.
4,000	5,000	.0015	0.	*
8,000	10,000	.0030	0.	
12,000	15,000	.0048	.0001	
16,000	20,000	.0064	.0001	
20,000	25,000	.0080	.0001	
24,000	30,000	.0098	.0001	
28,000	35,000	.0114	.0001	* E., 30,612,200.
28,800	36,000	.0118	.....	
29,600	37,000	.0121	.....	
30,400	38,000	.0125	.....	
31,200	39,000	.0128	.....	
32,000	40,000	.0130	.....	
32,800	41,000	.0134	.....	
33,600	42,000	.0137	.....	
34,400	43,000	.0140	.....	
35,200	44,000	.0145	.....	
35,600	44,500	.0147	.....	Elastic limit.
36,000	45,000	.0218	.....	Ultimate strength.
36,400	45,500	.06	.....	

Failed by triple flexure.

No. 788.

Marks, $\frac{4}{795}$
C., .37. Mn., .70.
Length, 12″.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.
4,000	5,000	.0015	.0001	*
8,000	10,000	.0030	.0001	
12,000	15,000	.0048	.0001	
16,000	20,000	.0065	.0002	
20,000	25,000	.0080	.0003	
24,000	30,000	.0098	.0004	
28,000	35,000	.0114	.0005	
32,000	40,000	.0133	.0005	
36,000	45,000	.0148	.0006	* E., 31,250,000.
36,800	46,000	.0155	.....	
37,600	47,000	.0160	.....	Elastic limit.
38,000	47,500	.06	.....	
40,700	50,875	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 789.

Marks, $\frac{5}{803}$
C., .51. Mn., .58. Si., .02.
Length, 12″.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.
4,000	5,000	.0014	0.	
8,000	10,000	.0031	0.	
12,000	15,000	.0048	0.	
16,000	20,000	.0063	0.	
20,000	25,000	.0080	0.	
24,000	30,000	.0098	.0001	
28,000	35,000	.0116	.0002	
32,000	40,000	.0132	.0003	
36,000	45,000	.0150	.0003	* E., 30,075,000.
36,800	46,000	.0152	.....	
37,600	47,000	.0156	.....	
38,400	48,000	.0160	.....	
39,200	49,000	.0162	.....	
40,000	50,000	.0166	.....	
40,800	51,000	.0170	.....	
41,600	52,000	.0173	.....	
42,400	53,000	.0179	.....	
43,200	54,000	.0181	.....	
44,000	55,000	.0185	.....	
44,800	56,000	.0190	.....	
45,600	57,000	.0193 .0196	.....	Elastic limit.
46,400	58,000	.....	.....	Ultimate strength; rapid compression and deflection.

Failed by triple flexure.

No. 790.

Marks, $\frac{6}{797}$
C., .57. Mn., .93. Si., .07.
Length, 12″.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.
4,000	5,000	.0013	0.	
8,000	10,000	.0030	0.	
12,000	15,000	.0048	0.	
16,000	20,000	.0063	0.	
20,000	25,000	.0080	0.	
24,000	30,000	.0097	0.	
28,000	35,000	.0113	0.	
32,000	40,000	.0131	.0001	
36,000	45,000	.0147	.0002	
40,000	50,000	.0164	.0002	* E., 30,201,000.
40,800	51,000	.0168	.....	
41,600	52,000	.0171	.....	
42,400	53,000	.0175	.....	
43,200	54,000	.0179	.....	
44,000	55,000	.0182	.....	
44,400	55,500	.0184	.....	Elastic limit.
44,800	56,000	.0191	.....	
45,200	56,500	.0201	.....	
45,600	57,000	.0219	.....	
46,400	58,000	.0410	.....	
52,400	65,500	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 791.

Marks, $\frac{7}{823}$
C., .71. Mn., .58. Si., .08.
Length, 12″.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.
4,000	5,000	.0014	0.	
8,000	10,000	.0031	0.	
12,000	15,000	.0047	0.	
16,000	20,000	.0065	0.	
20,000	25,000	.0081	0.	
24,000	30,000	.0096	0.	
28,000	35,000	.0115	0.	
32,000	40,000	.0129	0.	
36,000	45,000	.0147	.0001	
40,000	50,000	.0162	.0003	* E., 31,034,000.
40,800	51,000	.0168	.....	
41,600	52,000	.0170	.....	
42,400	53,000	.0175	.....	
43,200	54,000	.0180	.....	
44,000	55,000	.0184	.....	
44,400	55,500	.0187	.....	Elastic limit.
44,800	56,000	.0196	.....	
45,200	56,500	.0240	.....	
45,600	57,000	.0306	.....	
46,400	58,000	.0545	.....	
52,350	65,440	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 792.

Marks, $\frac{8}{750}$
C., .81. Mn., .56. Si., .17.
Length, 12″.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.
4,000	5,000	.0013	0.	*
8,000	10,000	.0031	0.	
12,000	15,000	.0047	0.	
16,000	20,000	.0064	0.	
20,000	25,000	.0081	0.	
24,000	30,000	.0097	0.	
28,000	35,000	.0114	0.	
32,000	40,000	.0131	0.	
36,000	45,000	.0148	.0001	
40,000	50,000	.0164	.0001	* E., 30,000,000.
44,000	55,000	.0181	.....	
48,000	60,000	.0200	.....	
52,000	65,000	.0217	.....	
52,800	66,000	.0221	.....	
53,600	67,000	.0225	.....	
54,400	68,000	.0228	.....	
55,200	69,000	.0232	.....	
56,000	70,000	.0236	.0005	
56,800	71,000	.0240	.....	
57,600	72,000	.0243	.....	
58,400	73,000	.0248	.....	
59,200	74,000	.0252	.....	
59,600	74,500	.0254	.....	Elastic limit.
60,000	75,000	.0261	.....	
60,400	75,500	.0264	.....	
60,800	76,000	.0277	.....	
61,200	76,500	.0296	.....	
61,600	77,000	.0338	.....	
62,400	78,000	.0400	.....	
63,200	79,000	.0444	.....	
64,000	80,000	.0485	.....	
70,200	87,750	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 793.

Marks, $\frac{9}{756}$
C., .89. Mn., .57. Si., .19.
Length, 12″.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.
4,000	5,000	.0014	0.	*
8,000	10,000	.0031	0.	
12,000	15,000	.0048	.0001	
16,000	20,000	.0064	.0001	
20,000	25,000	.0082	.0002	
24,000	30,000	.0098	.0003	
28,000	35,000	.0116	.0003	
32,000	40,000	.0132	.0003	
36,000	45,000	.0149	.0003	
40,000	50,000	.0164	.0003	* E., 30,612,000.
44,000	55,000	.0182	.0003	
48,000	60,000	.0198	.0003	
52,000	65,000	.0215	.....	
52,800	66,000	.0218	.....	
53,600	67,000	.0222	.....	
54,400	68,000	.0225	.....	
55,200	69,000	.0229	.....	
56,000	70,000	.0232	.....	
56,800	71,000	.0236	.....	
57,600	72,000	.0240	.....	
58,400	73,000	.0242	.....	
59,200	74,000	.0246	.....	
60,000	75,000	.0249	.....	
60,800	76,000	.0252	.....	
61,200	76,500	.0254	.....	Elastic limit.
61,600	77,000	.0259	.....	
62,000	77,500	.0270	.....	
62,400	78,000	.0310	.....	
63,100	79,000	.0480	.....	
67,300	84,125	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 794.

Marks, $\frac{10}{334}$
C., .97. Mn., .80. Si., .28.
Length, 12″.
Diameter, 1.″0092.
Sectional area, .80 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.
4,000	5,000	.0015	0.	*
8,000	10,000	.0031	0.	
12,000	15,000	.0049	.0001	
16,000	20,000	.0065	.0001	
20,000	25,000	.0081	.0001	
24,000	30,000	.0097	.0001	
28,000	35,000	.0113	.0001	
32,000	40,000	.0129	.0002	
36,000	45,000	.0146	.0002	
40,000	50,000	.0163	.0002	* E., 30,822,000.
44,000	55,000	.0181	.0002	
48,000	60,000	.0197	.0002	
52,000	65,000	.0215	.0002	
56,000	70,000	.0230	.....	
56,800	71,000	.0234	.....	
57,600	72,000	.0237	.....	
58,400	73,000	.0241	.....	
59,200	74,000	.0245	.....	
60,000	75,000	.0250	.....	
60,800	76,000	.0253	.....	
61,600	77,000	.0256	.....	
62,400	78,000	.0260	.....	
63,200	79,000	.0263	.....	
64,000	80,000	.0267	.....	
64,800	81,000	.0271	.....	
65,600	82,000	.0276	.....	
66,400	83,000	.0281	.....	Elastic limit.
66,800	83,500	.0288	.....	
67,200	84,000	.0398	.....	
67,600	84,500	.0428	.....	
68,000	85,000	.0445	.....	
68,800	86,000	.0468	.....	
69,600	87,000	.0502	.....	
70,400	88,000	.0534	.....	
71,200	89,000	.0596	.....	
73,200	91,500	.....	.....	Ultimate strength.

Failed by triple flexure.

DETAILS OF TENSION TESTS.

No. 753.

Marks, $\frac{1}{833}$
C., .09. Mn., .11.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.[a]
1,600	2,000	.0010	.....	
2,400	3,000	.0019	.....	
3,200	4,000	.0029	.....	
4,000	5,000	.0039	0.	
4,800	6,000	.0049	.....	
5,600	7,000	.0059	.....	
6,400	8,000	.0070	.....	
7,200	9,000	.0080	.....	
8,000	10,000	.0089	.0001	
8,800	11,000	.0100	.....	
9,600	12,000	.0110	.....	
10,400	13,000	.0120	.....	
11,200	14,000	.0130	.....	
12,000	15,000	.0140	.0002	
12,800	16,000	.0151	.....	
13,600	17,000	.0161	.....	
14,400	18,000	.0171	.....	
15,200	19,000	.0181	.....	
16,000	20,000	.0191	.....	
16,800	21,000	.0202	.0003	[a]E., 30,151,000.
4,000	5,000	.0043	.....	
8,000	10,000	.0093	.....	
12,000	15,000	.0142	.....	
16,800	21,000	.0202	.0004	
16,800	21,000	.0202	.0004	

No. 754.

Marks, $\frac{2}{123}$
C., .20. Mn., .45.
Diameter, 1.″0092.
Sectional area, .80 square inch.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.*
1,600	2,000	.0010	.....	
2,400	3,000	.0020	.....	
3,200	4,000	.0029	.....	
4,000	5,000	.0039	0.	
4,800	6,000	.0049	.....	
5,600	7,000	.0060	.....	
6,400	8,000	.0070	.....	
7,200	9,000	.0080	.....	
8,000	10,000	.0090	.0001	
8,800	11,000	.0100	.....	
9,600	12,000	.0110	.....	
10,400	13,000	.0120	.....	
11,200	14,000	.0130	.....	
12,000	15,000	.0140	.0001	
12,800	16,000	.0149	.....	
13,600	17,000	.0160	.....	
14,400	18,000	.0170	.....	
15,200	19,000	.0180	.....	
16,000	20,000	.0190	.....	
16,800	21,000	.0200	.0001	* E, 30,151,000.
16,800	21,000	.0200	.....	
17,600	22,000	.0210	.....	
18,400	23,000	.0220	.....	
19,200	24,000	.0230	.....	
20,000	25,000	.0240	.0001	

No. 755.

Marks, $\frac{3}{782}$
C., .31. Mn., .57.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.*
1,600	2,000	.0011	.....	
2,400	3,000	.0021	.....	
3,200	4,000	.0031	.....	
4,000	5,000	.0042	.0002	
4,800	6,000	.0052	.....	
5,600	7,000	.0062	.....	
6,400	8,000	.0074	.....	
7,200	9,000	.0084	.....	
8,000	10,000	.0094	.0005	
8,800	11,000	.0104	.....	
9,600	12,000	.0114	.....	
10,400	13,000	.0125	.....	
11,200	14,000	.0135	.....	
12,000	15,000	.0145	.0006	
12,800	16,000	.0155	.....	
13,600	17,000	.0166	.....	
14,400	18,000	.0176	.....	
15,200	19,000	.0187	.....	
16,000	20,000	.0197	.....	
16,800	21,000	.0208	.0008	* E., 30,000,000.
17,600	22,000	.0218	.....	
18,400	23,000	.0228	.....	
19,200	24,000	.0238	.....	
20,000	25,000	.0248	.0009	

No. 756.

Marks, $\frac{4}{795}$
C., .37. Mn., .70.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.*
1,600	2,000	.0010	.....	
2,400	3,000	.0020	.....	
3,200	4,000	.0030	.0001	
4,000	5,000	.0050	.....	
4,800	6,000	.0060	.....	
5,600	7,000	.0070	.....	
6,400	8,000	.0081	.....	
7,200	9,000	.0090	.0002	
8,000	10,000	.0102	.....	
8,800	11,000	.0112	.....	
9,600	12,000	.0122	.....	
10,400	13,000	.0132	.....	
11,200	14,000	.0142	.0003	
12,000	15,000	.0142	.0003	
12,800	16,000	.0152	.....	
13,600	17,000	.0162	.....	
14,400	18,000	.0172	.....	
15,200	19,000	.0183	.....	
16,000	20,000	.0193	.....	
16,800	21,000	.0203	.0004	* E., 30,151,000.
17,600	22,000	.0215	.....	
18,400	23,000	.0225	.....	
19,200	24,000	.0235	.....	
20,000	25,000	.0245	.0005	

No. 757.

Marks, $\frac{5}{803}$
C., .51. Mn., .58. Si., .02.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.*
1,600	2,000	.0010	.....	
2,400	3,000	.0020	.....	
3,200	4,000	.0030	.....	
4,000	5,000	.0040	.0001	
4,800	6,000	.0050	.....	
5,600	7,000	.0061	.....	
6,400	8,000	.0071	.....	
7,200	9,000	.....	.....	
8,000	10,000	.0090	.0001	
8,800	11,000	.....	.....	
9,600	12,000	.0109	.....	
10,400	13,000	.....	.....	
11,200	14,000	.0130	.....	
12,000	15,000	.0140	.0001	
12,800	16,000	.0150	.....	
13,600	17,000	.....	.....	
14,400	18,000	.0170	.....	
15,200	19,000	.....	.....	
16,000	20,000	.0190	.....	
16,800	21,000	.0200	.0001	
17,600	22,000	.0211	.....	
19,200	24,000	.0221	.....	
20,000	25,000	.0241	.0001	
20,800	26,000	.0251	.....	
22,400	28,000	.0271	.....	
24,000	30,000	.0291	.0001	*E., 30,000,000.

No. 758.

Marks, $\frac{6}{797}$
C., 57. Mn., .93. Si., .07.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 30.″

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.*
1,600	2,000	.0010	.....	
2,400	3,000	.0020	.....	
3,200	4,000	.0030	.....	
4,000	5,000	.0040	0.	
4,800	6,000	.0050	.....	
5,600	7,000	.0060	.....	
6,400	8,000	.0070	.....	
7,200	9,000	.0080	.....	
8,000	10,000	.0090	0.	
12,000	15,000	.0140	0.	
16,000	20,000	.0190	.0001	
16,800	21,000	.0200	.0001	
20,000	25,000	.0240	.0001	
20,800	26,000	.0250	.....	
21,600	27,000	.0260	.....	
22,400	28,000	.0270	.....	
23,200	29,000	.0280	.....	
24,000	30,000	.0290	.0001	*E., 30,104,000.

No. 759.

Marks, $\frac{7}{823}$
C., .71. Mn., .58. Si., .08.
Diameter, 1.″0092.
Sectional area, .80 square inch.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total..	Per square inch.	Elongation	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.*
1,600	2,000	.0010	.....	
2,400	3,000	.0020	.....	
3,200	4,000	.0029	.....	
4,000	5,000	.0039	0.	
4,800	6,000	.0049	.....	
5,600	7,000	.0059	.....	
6,400	8,000	.0069	.....	
7,200	9,000	.0080	.....	
8,000	10,000	.0090	0.	
12,000	15,000	.0140	0.	
16,000	20,000	.0190	.....	
16,800	21,000	.0200	0.	
20,000	25,000	.0240	.0001	
24,000	30,000	.0290	.0001	
24,800	31,000	.0300	.....	
25,600	32,000	.0310	.....	
26,400	33,000	.0320	.....	
27,200	34,000	.0330	.....	
28,000	35,000	.0340	.0001	*E., 30,038,000.

No. 760.

Marks, $\frac{8}{750}$
C., .81. Mn., .56. Si., .17.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.*
1,600	2,000	.0010	.....	
2,400	3,000	.0020	.....	
3,200	4,000	.0030	.....	
4,000	5,000	.0040	0.	
4,800	6,000	.0049	.....	
5,600	7,000	.0059	.....	
6,400	8,000	.0070	.....	
7,200	9,000	.0080	.....	
8,000	10,000	.0090	0.	
12,000	15,000	.0139	0.	
16,000	20,000	.0191	.....	
16,800	21,000	.0201	—.0001	
20,000	25,000	.0239	—.0001	
24,000	30,000	.0289	—.0001	
28,000	35,000	.0339	—.0001	
28,800	36,000	.0349	.....	
29,600	37,000	.0359	.....	
30,400	38,000	.0369	.....	
31,200	39,000	.0380	.....	
32,000	40,000	.0391	—.0001	
32,000	40,000	.0390	—.0001	*E., 29,923,000.

No. 761.

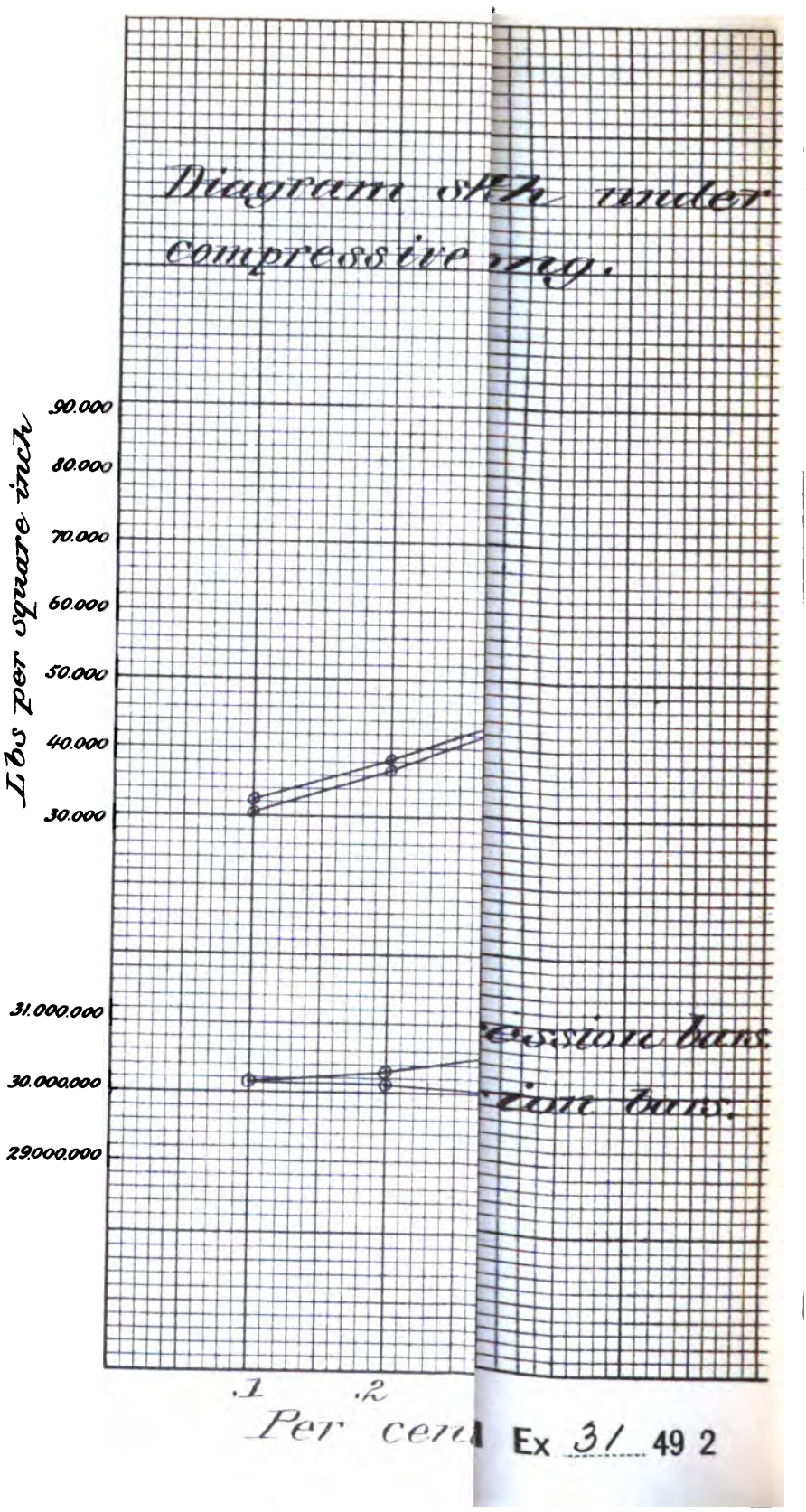
Marks, $\frac{9}{756}$
C., .89. Mn., .57. Si., .19.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.*
1,600	2,000	.0010	.....	
2,400	3,000	.0020	.....	
3,200	4,000	.0030	.....	
4,000	5,000	.0040	0.	
4,800	6,000	.0050	.....	
5,600	7,000	.0060	.....	
6,400	8,000	.0070	.....	
7,200	9,000	.0081	.....	
8,000	10,000	.0091	.0001	
12,000	15,000	.0141	.0001	
16,000	20,000	.0192	.....	
16,800	21,000	.0202	.0002	
20,000	25,000	.0242	.0002	
24,000	30,000	.0292	.0002	
28,000	35,000	.0342	.0003	
32,000	40,000	.0393	.0003	
32,800	41,000	.0404	.....	
33,600	42,000	.0414	.....	
34,400	43,000	.0424	.....	
35,200	44,000	.0436	.....	
36,000	45,000	.0445	.0003	
36,000	45,000	.0446	.0004	*E., 29,864,000.
36,000	45,000	.0446	.....	
32,000	40,000	.0395	.....	
28,000	35,000	.0345	.....	
24,000	30,000	.0295	.....	
20,000	25,000	.0245	.....	
16,000	20,000	.0195	.....	
12,000	15,000	.0145	.....	
8,000	10,000	.0095	.....	
4,000	5,000	.0044	.....	
800	1,000	.0004	.....	

No. 762.

Marks, $\frac{10}{334}$
C., .97. Mn., .80 Si., .28.
Diameter, 1″.0092
Sectional area, .80 square nch.
Gauged length. 3t

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.*
1,600	2,000	.0009	.....	
2,400	3,000	.0018	.....	
3,200	4,000	.0028	.....	
4,000	5,000	.0037	0.	
4,800	6,000	.0047	.....	
5,600	7,000	.0057	.....	
6,400	8,000	.0067	.....	
7,200	9,000	.0078	.....	
8,000	10,000	.0088	0.	
12,000	15,000	.0138	0.	
16,000	20,000	.0199	.....	
16,800	21,000	.0201	0.	
20,000	25,000	.0240	0.	
24,000	30,000	.0290	0.	
28,000	35,000	.0341	.0002	
32,000	40,000	.0393	.0003	
36,000	45,000	.0447	.0003	
36,800	46,000	.0457	.....	
37,600	47,000	.0467	.....	
38,400	48,000	.0477	.....	
39,200	49,000	.0487	.....	
40,000	50,000	.0497	.0004	* E., 29,817,000.
40,000	50,000	.0497	.....	
36,000	45,000	.0448	.....	
32,000	40,000	.0396	.....	
28,000	35,000	.0346	.....	
24,000	30,000	.0296	.....	
20,000	25,000	.0247	.....	
16,000	20,000	.0198	.....	
12,000	15,000	.0145	.....	
8,000	10,000	.0095	.....	
4,000	5,000	.0044	.....	
800	1,000	.0005	.....	Rested 1 hour.
800	1,000	.0008	.....	
4,000	5,000	.0047	.....	
8,000	10,000	.0097	.....	
12,000	15,000	.0148	.....	
16,000	20,000	.0200	.....	
20,000	25,000	.0248	.....	
24,000	30,000	.0298	.....	
28,000	35,000	.0348	.....	
32,000	40,000	.0398	.....	
36,000	45,000	.0450	.....	
40,000	50,000	.0500	.....	
36,000	45,000	.0452	.....	
32,000	40,000	.0400	.....	
28,000	35,000	.0350	.....	
24,000	30,000	.0299	.....	
20,000	25,000	.0249	.....	
16,000	20,000	.0200	.....	
12,000	15,000	.0149	.....	
8,000	10,000	.0098	.....	
4,000	5,000	.0048	.....	
800	1,000	.0008	.....	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Per cent

Ex 31 49 2

TABULATION OF STEEL BARS.—TEMPERATURE SERIES.

Chemical analysis.			Compression tests.								Tension tests.	
Carbon.	Manganese.	Silicon.	No. of test.	Length.	Diameter.	Sectional area.	Elastic limit per square inch.	Ultimate strength per square inch.	Modulus of elasticity per square inch.	Manner of failure.	No. of test.	Modulus of elasticity per square inch.
Per ct.	*Per cent.*	*Per cent.*		*Inches.*	*Inches.*	*Sq. inch.*	*Pounds.*	*Pounds.*	*Pounds.*			*Pounds.*
.09	.11	.....	785	12	1.0092	.80	30,500	32,125	30,120,000	Triple flexure	753	30,151,000
.20	.45	.....	786	12	1.0092	.80	37,000	39,190	30,303,000	....do	754	30,151,000
.31	.57	.....	787	12	1.0092	.80	44,500	45,500	30,612,000	....do	755	30,000,000
.37	.70	.....	788	12	1.0092	.80	47,000	50,875	31,250,000	....do	756	30,151,000
.51	.58	.02	789	12	1.0092	.80	57,000	58,000	30,075,000	....do	757	30,000,000
.57	.93	.07	790	12	1.0092	.80	55,500	65,500	30,201,000	....do	758	30,104,000
.71	.58	.08	791	12	1.0092	.80	55,500	65,440	31,034,000	....do	759	30,088,000
.81	.56	.17	792	12	1.0092	.80	74,500	87,750	30,000,000	....do	760	29,923,000
.89	.57	.19	793	12	1.0092	.80	76,500	84,125	30,612,000	....do	761	29,864,000
.97	.80	.28	794	12	1.0092	.80	83,000	91,500	30,822,000	....do	762	29,817,000

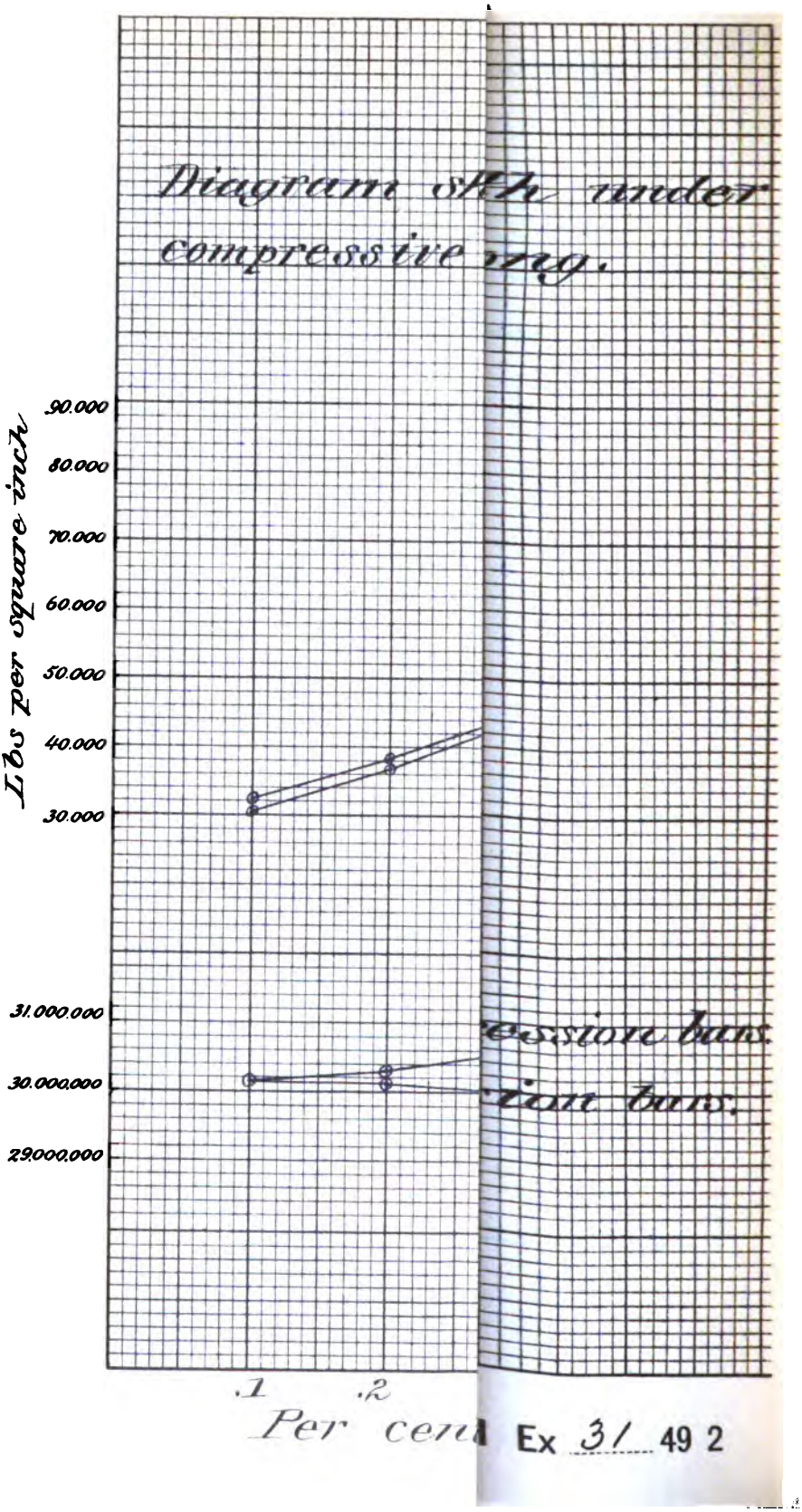


Diagram sth under compressive stg.
Lbs per square inch
90.000
80.000
70.000
60.000
50.000
40.000
30.000
31.000.000
30.000.000
29.000.000
.1
.2
Per cent
Ex 31 49 2

TABULATION OF STEEL BARS.—TEMPERATURE SERIES.

Chemical analysis.			Compression tests.								Tension tests.	
Carbon.	Manganese.	Silicon.	No. of test.	Length.	Diameter.	Sectional area.	Elastic limit per square inch.	Ultimate strength per square inch.	Modulus of elasticity per square inch.	Manner of failure.	No. of test.	Modulus of elasticity per square inch.
Per ct.	*Per cent.*	*Per cent.*		*Inches.*	*Inches.*	*Sq. inch.*	*Pounds.*	*Pounds.*	*Pounds.*			*Pounds.*
.09	.11	.....	785	12	1.0092	.80	30,500	32,125	30,120,000	Triple flexure	753	30,151,000
.20	.45	.....	786	12	1.0092	.80	37,000	39,190	30,303,000	....do	754	30,151,000
.31	.57	.....	787	12	1.0092	.80	44,500	45,500	30,612,000	....do	755	30,000,000
.37	.70	.....	788	12	1.0092	.80	47,000	50,875	31,250,000	....do	756	30,151,000
.51	.58	.02	789	12	1.0092	.80	57,000	58,000	30,075,000	....do	757	30,000,000
.57	.93	.07	790	12	1.0092	.80	55,500	65,500	30,201,000	....do	758	30,104,000
.71	.58	.08	791	12	1.0092	.80	55,500	65,440	31,034,000	....do	759	30,088,000
.81	.56	.17	792	12	1.0092	.80	74,500	87,750	30,000,000	....do	760	29,923,000
.89	.57	.19	793	12	1.0092	.80	76,500	84,125	30,612,000	....do	761	29,864,000
.97	.80	.28	794	12	1.0092	.80	83,000	91,500	30,822,000	....do	762	29,817,000

RE-TESTS OF WROUGHT-IRON BARS.

The object in re-testing these bars was to determine the present modulus of elasticity of the metal after their previous straining, and learn the effects of annealing.

The specimens were turned down to 1″.129 diameter from their rough surfaces, which were 2″ diameter before the original tests were made.

Elongations were measured along three lines, 120° apart, on the cylindrical surface of the stem, measuring the elongations on one line at a time, the specimen being rotated through 120° each time, so as to bring the measured line on the upper surface in the testing machine.

Specimens from the same bar show very nearly the same modulus of elasticity.

The annealed specimens were shortened by that process, confirming the results obtained with specific gravity specimens, which showed the density of overstrained steel was increased by annealing.

Specimen No. 694 was considerably warped by the annealing. No. 693 was left very nearly straight.

Comparing the modulus of elasticity of the latter bar at different stages, it is seen that annealing effects a reduction which the bar partially recovers from, after the lapse of time; thus the modulus of elasticity was—

Before annealing	27,998,000
After annealing	26,995,000
Reduction	1,003,000
After annealing and a rest of 24 days	27,322,000
Recovery	327,000

These differences are not large, yet such as they are they show a conformity in behavior of the annealed metal with the overstrained iron and steel eye-bars.

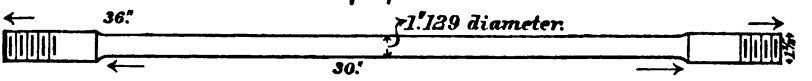
SPECIMENS FROM FRACTURED END OF DOUBLE-REFINED BAR L 210.

[Original test made May 24, 1882. No. 604, Report of Tests, 1882.]

Synopsis of original test.

Ultimate strength, 50,188 pounds per square inch.
Elongation in 80 inches, 19.9 per cent.
Contraction of area, 43 per cent.

Form of Specimens.



Elongations measured on the gauged lengths of 30″ along three lines, A, B, and C.

No. 690.

First Specimen.

Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 30″.

Applied loads per square inch.	Elongations on lines.			Mean elongations.	Remarks.
	A.	B.	C.		
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
5,000	0.	0.	0.	0.	Initial load.
6,000	.0010	.0010	.0010	.00100	
7,000	.0021	.0021	.0020	.00207	
8,000	.0032	.0032	.0030	.00313	
9,000	.0043	.0042	.0041	.00420	
10,000	.0054	.0053	.0052	.00530	
12,000	.0075	.0075	.0075	.00750	
14,000	.0097	.0096	.0096	.00963	
15,000	.0108	.0108	.0107	.01077	
16,000	.0119	.0118	.0118	.01183	
18,000	.0141	.0141	.0140	.01407	
20,000	.0163	.0161	.0162	.01620	
22,000	.0185	.0185	.0183	.01843	
24,000	.0207	.0206	.0205	.02060	
25,000	.0219	.0217	.0217	.02177	
5,000	.0000	.0001	.0001	.00007	
10,000	.0054	.0055	.0055	.00547	
15,000	.0109	.0110	.0110	.01097	
20,000	.0165	.0164	.0164	.01643	
25,000	.0219	.0218	.0218	.02183	
5,000	.0000	.0001	.0001	.00007	
10,000	.0055	.0055	.0054	.00547	
15,000	.0109	.0110	.0109	.01093	
20,000	.0164	.0163	.0164	.01637	
25,000	.0220	.0218	.0217	.02183 }	E., 27,612,000.
5,000	.0001	.0001	.0001	.00010 }	

SPECIMENS FROM FRACTURED END OF DOUBLE-REFINED BAR S 218.

[Original test made May 22, 1882. No. 506, Report of Tests, 1882.]

Synopsis of original test.

Ultimate strength, 50,631 pounds per square inch.
Elastic limit, 24,610 pounds per square inch.
Elongation in 80 inches, 20.4 per cent.
Contraction of area, 41 per cent.

No. 691.

FIRST SPECIMEN.

(Same form as specimens from bar L 210.)

Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 30″.

Applied loads per square inch.	Elongations on lines.			Mean elongations.	Remarks.
	A.	B.	C.		
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
5,000	0.	0.	0.	0.	Initial load.
10,000	.0053	.0053	.0053	.00530	
15,000	.0106	.0107	.0107	.01067	
20,000	.0160	.0160	.0161	.01603	
25,000	.0214	.0213	.0215	.02140	
5,000	.0000	.0000	.0001	.00003	
10,000	.0052	.0053	.0055	.00533	
15,000	.0106	.0107	.0109	.01073	
20,000	.0159	.0160	.0162	.01603	
25,000	.0214	.0215	.0216	.02150	
5,000	—.0001	.0000	.0000	—.00003	
10,000	.0052	.0053	.0055	.00533	
15,000	.0106	.0108	.0108	.01073	
20,000	.0159	.0161	.0162	.01607	
25,000	.0214	.0214	.0216	.02147	E=27,907,000.
5,000	—.0001	.0000	.0000	—.00003	

No. 692.

SECOND SPECIMEN.

Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 30″.

Applied loads per square inch.	Elongations on lines.			Mean elongations.	Remarks.
	A.	B.	C.		
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
5,000	0.	0.	0.	0.	Initial load.
10,000	.0053	.0053	.0053	.00530	
15,000	.0108	.0107	.0107	.01073	
20,000	.0162	.0160	.0161	.01610	
25,000	.0216	.0214	.0214	.02147	
5,000	.0002	.0000	—.0001	.00003	
10,000	.0055	.0053	.0053	.00537	
15,000	.0109	.0107	.0107	.01077	
20,000	.0162	.0162	.0160	.01613	
25,000	.0216	.0215	.0214	.02150	
5,000	.0002	.0000	—.0001	.00003	
10,000	.0055	.0055	.0054	.00547	
15,000	.0109	.0107	.0107	.01077	
20,000	.0163	.0160	.0160	.01610	
25,000	.0216	.0214	.0214	.02147	E = 28,037,000.
5,000	.0003	.0000	—.0001	.00007	

No. 693.

THIRD SPECIMEN.

Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 30″.

Applied loads per square inch.	Elongations on lines. A.	B.	C.	Mean elongations.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
5,000	0.	0.	0.	0.	Initial load.
10,000	.0054	.0053	.0054	.00537	
15,000	.0108	.0106	.0108	.01073	
20,000	.0163	.0161	.0162	.01620	
25,000	.0216	.0214	.0216	.02153	
5,000	.0000	.0000	.0001	.00003	
10,000	.0055	.0054	.0055	.00547	
15,000	.0109	.0108	.0108	.01082	
20,000	.0163	.0162	.0162	.01623	
25,000	.0217	.0215	.0216	.02160	
5,000	.0002	.0001	.0002	.00017	
10,000	.0056	.0054	.0055	.00550	
15,000	.0110	.0108	.0108	.01087	
20,000	.0164	.0162	.0162	.01627	
25,000	.0218	.0215	.0216	.02163	E = 27,998,000.
5,000	.0003	.0001	.0002	.00020	

Bar heated dull red in a forge fire and cooled in the open air. This annealing shortened the bar, measured on the gauged length, as follows: Lines A, ″.0016; B, ″.0019; C, ″.0011; average, ″.0015⅓.

(Observations repeated on the modulus of elasticity.)

Applied loads per square inch.	Elongations on lines. A.	B.	C.	Mean elongations.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
5,000	0.	.....	.....	.....	Initial load.
10,000	.0057	.....	.....	.....	
15,000	.0114	.....	.....	.....	
20,000	.0177	.....	.....	.....	
25,000	.0278	.....	.....	.....	
5,000	.0055	.....	.....	.....	
5,000	.0000	0.	0.	0.	Micrometer reset to zero after first loading.
10,000	.0055	.0055	.0056	.00553	
15,000	.0110	.0110	.0113	.01110	
20,000	.0167	.0166	.0168	.01670	
5,000	0.	0.	.0002	.00007	
10,000	.0055	.0055	.0059	.00563	
15,000	.0111	.0110	.0115	.01120	
20,000	.0167	.0166	.0170	.01677	E = 26,995,000.
5,000	0.	0.	.0003	.00010	
Bar again examined after a rest of 24 days, after annealing.					
5,000	0.	0.	0.	0.	Initial load
10,000	.0056	.0056	.0054	.00553	
15,000	.0111	.0112	.0111	.01113	
20,000	.0167	.0165	.0165	.01657	
5,000	.0001	.0002	.0003	.00017	
10,000	.0057	.0056	.0056	.00563	
15,000	.0113	.0112	.0111	.01120	
20,000	.0168	.0168	.0165	.01670	E = 27,322,000.
5,000	.0002	.0002	.0003	.00023	

CUBIC COMPRESSION OF VARIOUS METALS AND WOOD.

1661

No. 693.

THIRD SPECIMEN.

Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 30″.

Applied loads per square inch.	Elongations on lines. A.	B.	C.	Mean elongations.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
5,000	0.	0.	0.	0.	Initial load.
10,000	.0054	.0053	.0054	.00537	
15,000	.0108	.0106	.0108	.01073	
20,000	.0163	.0161	.0162	.01620	
25,000	.0216	.0214	.0216	.02153	
5,000	.0000	.0000	.0001	.00003	
10,000	.0055	.0054	.0055	.00547	
15,000	.0109	.0108	.0108	.01082	
20,000	.0163	.0162	.0162	.01623	
25,000	.0217	.0215	.0216	.02160	
5,000	.0002	.0001	.0002	.00017	
10,000	.0056	.0054	.0055	.00550	
15,000	.0110	.0108	.0108	.01087	
20,000	.0164	.0162	.0162	.01627	
25,000	.0218	.0215	.0216	.02163	E = 27,993,000.
5,000	.0003	.0001	.0002	.00020	

Bar heated dull red in a forge fire and cooled in the open air. This annealing shortened the bar, measured on the gauged length, as follows: Lines A, ″.0016; B, ″.0019; C, ″.0011; average, ″.0015¼.

(Observations repeated on the modulus of elasticity.)

Applied loads per square inch.	Elongations on lines. A.	B.	C.	Mean elongations.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
5,000	0.	.....	.....	.....	Initial load.
10,000	.0057	.....	.....	.....	
15,000	.0114	.....	.....	.....	
20,000	.0177	.....	.....	.....	
25,000	.0278	.....	.....	.....	
5,000	.0055	.....	.....	.....	
5,000	.0000	0.	0.	0.	Micrometer reset to zero after first loading.
10,000	.0055	.0055	.0056	.00553	
15,000	.0110	.0110	.0113	.01110	
20,000	.0167	.0166	.0168	.01670	
5,000	0.	0.	.0002	.00007	
10,000	.0055	.0055	.0059	.00563	
15,000	.0111	.0110	.0115	.01120	
20,000	.0167	.0166	.0170	.01677	E = 26,995,000.
5,000	0.	0.	.0003	.00010	
Bar again examined after a rest of 24 days, after annealing.					
5,000	0.	0.	0.	0.	Initial load
10,000	.0056	.0056	.0054	.00553	
15,000	.0111	.0112	.0111	.01113	
20,000	.0167	.0165	.0165	.01657	
5,000	.0001	.0002	.0002	.00017	
10,000	.0057	.0056	.0056	.00563	
15,000	.0113	.0112	.0111	.01120	
20,000	.0168	.0168	.0165	.01670	E = 27,322,000.
5,000	.0002	.0002	.0003	.00023	

CUBIC COMPRESSION OF VARIOUS METALS AND WOOD.

1661

CUBIC COMPRESSION OF VARIOUS METALS AND WOOD.

Specimens of the same kind of metal were taken from the same bar, excepting the cast-irons.

The cast specimens of tin and lead were from the same ladles of molten metal.

Tests by tensile and compressive stresses were made with both uncompressed and cubic compressed specimens.

The cubic compressed specimens were subjected to an estimated hydrostatic pressure of 90,000 pounds per square inch; one steel specimen was compressed with 117,600 pounds per square inch.

The specimens when compressed were immersed in water in the bore of the steel cylinder, the dimensions of which were 10″ long, 6″ diameter outside, and ″.806 diameter of bore.

The effect of compression on the dimensions of the specimens was not appreciable with the steel, brass, and copper. The wrought-iron and cast specimens were smaller, and as the reduction in dimensions did not take place uniformly, the effect was attributed to closing interstices formed by blow-holes or the presence of cinder.

The water seemed to pass freely through the white pine, and the wood came out of the cylinder water-soaked and larger than when it went in.

There was not the same free penetration in the white oak; the middle part of its length was reduced in diameter, the greater reduction occurring in the direction parallel to the annual rings of growth.

A comparison of the results shows no appreciable change in the strength, elasticity, and ductility of the compressed over the uncompressed metal, except in the case of the lead, but as these specimens were cast from old bullets which contained impurities perhaps not uniformly distributed, it is not conclusive that cubic compression changed the properties of this metal.

Measurements of specimens before and after compressing with an estimated hydrostatic pressure of 90,000 pounds per square inch.

Diameter of bore of cylinder, ".806. Sectional area, .5102 square inch (90,000 × .5102) + 2,750 allowance for packing friction = 48,668 pounds, total load applied to piston.

No. of test.	Marks.	Material.	Applied pressure per square inch.	Before compression.		After compression.	
				Length.	Diameter.	Length.	Diameter.
			Pounds.	*Inches.*	*Inch.*	*Inches.*	*Inch.*
727	.....	Brass (drawn).....	90,000	5.507	.7500	5.507	.7500
728	1	Wrought iron.....	90,000	5.511	.7500	5.510	.7492
729	2	.....do.....	90,000	5.510	.7500	5.510	.7498
730	3	O. H. steel.....	90,000	5.504	.7502	5.504	.7502
731	4	.....do.....	117,600	5.509	.7998	5.510	.7998
732	1	Copper (drawn)	90,000	5.505	.7501	5.505	.7501
733	2	.....do.....	90,000	5.510	.7501	5.510	.7501
734†	1	Tin	90,000	5.505	.7504	5.505	.7504
735	2	.....do.....	90,000	5.497	.7503	5.497	.7502
736	1	Lead	90,000	5.509	.7500	5.509	.7500
737	2	.....do.....	90,000	5.501	.7492	5.502	.7491
738	12 T C3	Cast-iron (gun).....	90,000	5.437	.7497	5.434+	.7494
739‡	12 T C4	.....do.....	89,000	5.484	.7500	5.482	.7494
740§	1	White pine	84,900	5.506	.743	5.512	.755 / .765
741‖	2	.....do.....	84,900	5.505	.747	5.533	.760
742	.....	White oak	90,000	5.522	.740	5.522	.....
743	10%	Aluminum bronze.....	90,000	5.50 +	.6715 / .8014	No decided change.	
744	1	Zinc	90,000	5.501	.7502	5.499	.7500
745	2	.....do.....	90,000	5.502	.7500	5.502	.7499 ¶

* Bars found irregular in diameter after compressing, varying from ".0002 to ".0003.

† Showed no change in maximum dimensions; there were small local depressions, mere dots, in the cylindrical surface, and one spot, ".5 × ".4, which was depressed about ".004.

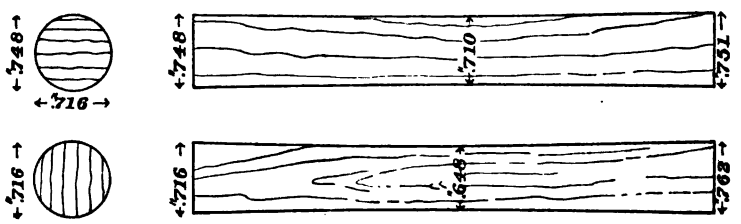
‡ Specimen was incased in thin brass, ".015 thick, in order to subject the metal to compression without allowing the water to enter the interstices of the casting.

§ Water exudes from ends and cylindrical surface after removal from water cylinder.

‖ Specimen compressed in liquid colored with cochineal, which showed the complete penetration of the liquid into the wood.

¶ A few small local depressions in cylindrical surfaces after about ".01 diameter.

Shape of white-oak cylinder after compressing.



DETAILS OF TENSION TESTS.

No. 703.

No. 1.—*Mild steel, uncompressed.*

Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	Initial load.
1,000	5,000	.0004	0.	
2,000	10,000	.0010	0.	
3,000	15,000	.0015	0.	
4,000	20,000	.0020	0.	
5,000	25,000	.0025	0.	
6,000	30,000	.0031	.....	
7,000	35,000	.0036	.....	
7,200	36,000	.0038	.....	
7,400	37,000	.0039	.....	
7,600	38,000	.0039	.....	
7,800	39,000	.0040	.....	
8,000	40,000	.0041	.....	
8,200	41,000	.0042	.....	
8,400	42,000	.0043	.....	
8,600	43,000	.0044	.....	
8,800	44,000	.0046	.....	Elastic limit.
9,000	45,000	.0825	.....	
9,200	46,000	.0867	.....	
9,400	47,000	.0907	.....	
9,600	48,000	.0970	.....	
9,800	49,000	.1046	.....	
10,000	50,000	.1120	.....	
10,200	51,000	.1187	.....	
10,400	52,000	.1265	.....	
10,600	53,000	.1340	.....	
10,800	54,000	.1440	.....	
11,000	55,000	.1541	.....	
11,200	56,000	.1650	.....	
11,400	57,000	.1780	.....	
11,600	58,000	.19	.....	
11,800	59,000	.21	.....	
12,000	60,000	.23	.....	
12,200	61,000	.25	.....	
12,400	62,000	.28	.....	
12,600	63,000	.30	.....	
12,800	64,000	.35	.....	
13,000	65,000	.40	.....	
13,200	66,000	.52	.....	
13,250	66,250	.63	.....	Tensile strength.
11,000	.....	.....	.....	Load at time of rupture.
0	0	.83	.....	= 27.7 per cent.

Elongation of inch sections, ″.19, *″.38, ″.26.
Diameter at fracture, ″.33.
Area, .0855 square inch.
Contraction, 57.2 per cent.
Fractured 1.28 from neck. Appearance, fine, silky.

No. 694.

SECOND SPECIMEN.

Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 30″.

Applied loads per square inch.	Elongations on lines. A.	B.	C.	Mean elongations.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
5,000	0.	0.	0.	0.	Initial load.
10,000	.0055	.0055	.0053	.00543	
15,000	.0110	.0109	.0110	.01097	
20,000	.0165	.0164	.0164	.01643	
25,000	.0220	.0219	.0219	.02193	
5,000	.0001	.0001	.0002	.00013	
10,000	.0056	.0054	.0056	.00553	
15,000	.0110	.0111	.0110	.01103	
20,000	.0166	.0164	.0165	.01650	
25,000	.0220	.0219	.0220	.02197	
5,000	.0000	.0000	.0002	.00007	
10,000	.0057	.0054	.0056	.00557	
15,000	.0111	.0110	.0111	.01107	
20,000	.0166	.0164	.0165	.01650	
25,000	.0220	.0219	.0220	.02197	E=27,523,000.
5,000	.0001	.0002	.0002	.00017	

Bar heated dull red in a forge fire and cooled in the open air. This annealing shortened the bar, measured on the gauged length, as follows: Lines A, —″.0004; B, —″.0015; C, +″.0071; average shortening=″.0017⅓.

In heating and cooling this bar was considerably warped, hence although there is an average permanent shortening as a whole, yet along lines A and B there is an apparent lengthening, due to the warping of the bar.

Applied loads per square inch.	Elongations on lines. A.	B.	C.	Mean elongations.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inches.*	*Inch.*	
5,000	0.	.....	.....	.....	Initial load.
10,000	.0057	.....	.....	.....	
15,000	.0117	.....	.....	.....	
20,000	.0185	.....	.....	.....	
25,000	.0298	.....	.....	.....	
5,000	.0073	.....	.....	.....	
5,000	0.	0.	0.	.....	Micrometer reset to zero after first loading.
10,000	.0055	.0056	.0057	.00560	
15,000	.0112	.0113	.0115	.01133	
20,000	.0169	.0170	.0174	.01710	
5,000	.0001	.0001	.0001	.00003	
10,000	.0055	.0058	.0059	.00573	
15,000	.0112	.0115	.0117	.01147	
20,000	.0169	.0172	.0175	.01720	
5,000	.0000	.0003	.0002	.00017	E=26,424,000.
Bar again examined after a period of rest of 24 days after annealing.					
5,000	0.	0.	0.	0.	Initial load.
10,000	.0057	.0056	.0059	.00573	
15,000	.0115	.0113	.0116	.01147	
20,000	.0171	.0170	.0174	.01717	
5,000	.0003	.0002	.0003	.00027	
10,000	.0059	.0056	.0059	.00580	
15,000	.0117	.0114	.0117	.01130	

Applied loads per square inch.	Elongations on lines. A.	B.	C.	Mean elongations.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inches.*	*Inch.*	
20,000	.0173	.0170	.0174	.01723	E=20,533,000.
5,000	.0003	.0003	.0002	.00027	
.....	.....	.....	.0001	.....	After 5 minutes' rest.
25,000	.....	.....	.0233	.....	
26,000	.....	.....	.0247	.....	
27,000	.....	.....	.0258	.....	
28,000	.....	.....	.0270	.....	
29,000	.....	.....	.0282	.....	
30,000	.....	.....	.0293	.....	
5,000	.....	.....	.0009	.....	
31,000	.....	.....	.0311	.....	Elastic limit.
32,000	.....	.....	.0392	.....	
28,000	.....	.....	.2510	.....	
29,000	.....	.....	.3700	.....	
30,000	.....	.....	.4015	.....	
31,000	.....	.....	.4250	.....	
32,000	.....	.....	.4490	.....	
33,000	.....	.....	.4900	.....	
34,000	.....	.....	.6245	.....	
35,000	.....	.....	.7110	.....	
36,000	.....	.....	.74	.....	
37,000	.....	.....	.85	.....	
38,000	.....	.....	.93	.....	
39,000	.....	.....	1.04	.....	
40,000	.....	.....	1.10	.....	
41,000	.....	.....	1.27	.....	
42,000	.....	.....	1.44	.....	
43,000	.....	.....	1.52	.....	
44,000	.....	.....	1.72	.....	
45,000	.....	.....	1.94	.....	
46,000	.....	.....	2.16	.....	
0	.....	.....	.....	.....	Rested 3 minutes.
47,000	.....	.....	2.20	.....	
48,000	.....	.....	2.62	.....	
49,000	.....	.....	2.84	.....	
50,000	.....	.....	3.40	.....	
51,000	.....	.....	3.82	.....	
52,000	.....	.....	4.80	.....	
52,400	.....	.....	5.65	.....	Tensile strength.
49,800	.....	.....	.....	.....	Load at time of rupture.

Total elongation in 30 inches, 19.7 per cent.
Diameter at fracture, ".92. Area, .665 square inch.
Contraction, 33.5 per cent.
Fractured 9" from neck. Appearance, fibrous 100 per cent.

SPECIMENS FROM FRACTURED END OF DOUBLE-REFINED BAR S 218.

[Original test made May 22, 1882. No. 506, Report of Tests, 1882.]

Synopsis of original test.

Ultimate strength, 50,631 pounds per square inch.
Elastic limit, 24,610 pounds per square inch.
Elongation in 80 inches, 20.4 per cent.
Contraction of area, 41 per cent.

No. 691.

FIRST SPECIMEN.

(Same form as specimens from bar L 210.)

Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 30″.

Applied loads per square inch.	Elongations on lines.			Mean elongations.	Remarks.
	A.	B.	C.		
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
5,000	0.	0.	0.	0.	Initial load.
10,000	.0053	.0053	.0053	.00530	
15,000	.0106	.0107	.0107	.01067	
20,000	.0160	.0160	.0161	.01603	
25,000	.0214	.0213	.0215	.02140	
5,000	.0000	.0000	.0001	.00003	
10,000	.0052	.0053	.0055	.00533	
15,000	.0106	.0107	.0109	.01073	
20,000	.0159	.0160	.0162	.01603	
25,000	.0214	.0215	.0216	.02150	
5,000	—.0001	.0000	.0000	—.00003	
10,000	.0052	.0053	.0055	.00533	
15,000	.0106	.0108	.0108	.01073	
20,000	.0159	.0161	.0162	.01607	
25,000	.0214	.0214	.0216	.02147	E=27,907,000.
5,000	—.0001	.0000	.0000	—.00003	

No. 692.

SECOND SPECIMEN.

Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 30″.

Applied loads per square inch.	Elongations on lines.			Mean elongations.	Remarks.
	A.	B.	C.		
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
5,000	0.	0.	0.	0.	Initial load.
10,000	.0053	.0053	.0053	.00530	
15,000	.0108	.0107	.0107	.01073	
20,000	.0162	.0160	.0161	.01610	
25,000	.0216	.0214	.0214	.02147	
5,000	.0002	.0000	—.0001	.00003	
10,000	.0055	.0053	.0053	.00537	
15,000	.0109	.0107	.0107	.01077	
20,000	.0162	.0162	.0160	.01613	
25,000	.0216	.0215	.0214	.02150	
5,000	.0002	.0000	—.0001	.00003	
10,000	.0055	.0055	.0054	.00547	
15,000	.0109	.0107	.0107	.01077	
20,000	.0163	.0160	.0160	.01610	
25,000	.0216	.0214	.0214	.02147	E = 28,037,000.
5,000	.0003	.0000	—.0001	.00007	

No. 693.

THIRD SPECIMEN.

Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 30″.

Applied loads per square inch.	Elongations on lines. A.	B.	C.	Mean elongations.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
5,000	0.	0.	0.	0.	Initial load.
10,000	.0054	.0053	.0054	.00537	
15,000	.0108	.0106	.0108	.01073	
20,000	.0163	.0161	.0162	.01620	
25,000	.0216	.0214	.0216	.02153	
5,000	.0000	.0000	.0001	.00003	
10,000	.0055	.0054	.0055	.00547	
15,000	.0109	.0108	.0108	.01082	
20,000	.0163	.0162	.0162	.01623	
25,000	.0217	.0215	.0216	.02160	
5,000	.0002	.0001	.0002	.00017	
10,000	.0056	.0054	.0055	.00550	
15,000	.0110	.0108	.0108	.01087	
20,000	.0164	.0162	.0162	.01627	
25,000	.0218	.0215	.0216	.02163	E = 27,908,000.
5,000	.0003	.0001	.0002	.00020	

Bar heated dull red in a forge fire and cooled in the open air. This annealing shortened the bar, measured on the gauged length, as follows: Lines A, ″.0016; B, ″.0019; C, ″.0011; average, ″.0015⅓.

(Observations repeated on the modulus of elasticity.)

Applied loads per square inch.	Elongations on lines. A.	B.	C.	Mean elongations.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
5,000	0.	.....	.....	.....	Initial load.
10,000	.0057	.....	.....	.....	
15,000	.0114	.....	.....	.....	
20,000	.0177	.....	.....	.....	
25,000	.0278	.....	.....	.....	
5,000	.0055	.....	.....	.....	
5,000	.0000	0.	0.	0.	Micrometer reset to zero after first loading.
10,000	.0055	.0055	.0056	.00553	
15,000	.0110	.0110	.0113	.01110	
20,000	.0167	.0166	.0168	.01670	
5,000	0.	0.	.0002	.00007	
10,000	.0055	.0055	.0059	.00563	
15,000	.0111	.0110	.0115	.01120	
20,000	.0167	.0166	.0170	.01677	E = 26,995,000.
5,000	0.	0.	.0003	.00010	
Bar again examined after a rest of 24 days, after annealing.					
5,000	0.	0.	0.	0.	Initial load
10,000	.0056	.0056	.0054	.00553	
15,000	.0111	.0112	.0111	.01113	
20,000	.0167	.0165	.0165	.01657	
5,000	.0001	.0002	.0002	.00017	
10,000	.0057	.0056	.0056	.00563	
15,000	.0113	.0112	.0111	.01120	
20,000	.0168	.0168	.0165	.01670	E = 27,322,000.
5,000	.0002	.0002	.0003	.00023	

CUBIC COMPRESSION OF VARIOUS METALS AND WOOD.

1661

No. 738.

Cast-iron, compressed.

Marks, $\frac{12T}{C_8}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	Initial load.
400	2,000	.0003	.....	
600	3,000	.0006	.....	
800	4,000	.0008	.....	
1,000	5,000	.0010	0.	
1,200	6,000	.0012	.....	
1,400	7,000	.0013	.....	
1,600	8,000	.0013	.....	
1,800	9,000	.0014	.....	
2,000	10,000	.0017	.0003	
2,200	11,000	.0020	.....	
2,400	12,000	.0022	.....	
2,600	13,000	.0024	.....	
2,800	14,000	.0026	.....	
3,000	15,000	.....	.....	
3,200	16,000	.....	.....	
3,400	17,000	.....	.....	
3,600	18,000	.....	.....	
3,800	19,000	.....	.....	
4,000	20,000	.....	.....	
4,200	21,000	.....	.....	
4,400	22,000	.....	.....	
4,600	23,000	.....	.....	
4,680	23,400	.....	.....	Tensile strength.

Fractured ″.25 from middle of stem. Appearance, granular, mottled.

No. 688.

Drawn brass, uncompressed.

Marked No. 2.
Total length, 4″.5.
Diameter, ″.55.
Sectional area, .228 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
228	1,000	0.	0.	Initial load.
1,140	5,000	.0007	0.	
2,280	10,000	.0017	0.	
3,420	15,000	.0027	0.	
4,560	20,000	.0037	0.	
5,700	25,000	.0050	.0003	
6,840	30,000	.0071	.0008	
7,068	31,000	.0074	.....	
7,296	32,000	.0078	.....	
7,524	33,000	.0082	.....	E'astic limit.
7,752	34,000	.0091	.....	
7,980	35,000	.0102	.0026	
8,208	36,000	.0110	.....	
8,436	37,000	.0125	.....	
8,664	38,000	.0150	.....	
8,892	39,000	.0189	.....	
9,120	40,000	.0223	.0118	
9,348	41,000	.0299	.....	
9,576	42,000	.0502	.....	
9,804	43,000	.0940	.....	
10,032	44,000	.1110	.....	
10,260	45,000	.1434	.....	
10,488	46,000	.185	.....	
10,716	47,000	.22	.....	
10,944	48,000	.26	.....	
11,172	49,000	.32	.....	
11,400	50,000	.34	.....	
11,628	51,000	.48	.....	
11,856	52,000	.55	.....	
12,084	53,000	.65	.....	
12,400	54,385	1.00	.....	Tensile strength.

No. 689.

Drawn brass rod, compressed.

Marked No. 1.
Diameter, ″.55.
Sectional area, .228 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
228	1,000	0.	0.	Initial load.
1,140	5,000	.0005	0.	
2,280	10,000	.0014	0.	
3,420	15,000	.0026	0.	
4,560	20,000	.0036	.0001	
5,700	25,000	.0053	.0006	
6,840	30,000	.0070	.0011	
7,068	31,000	.0077	.....	
7,296	32,000	.0081	.....	
7,524	33,000	.0087	.....	Elastic limit.
7,752	34,000	.0095	.....	
7,980	35,000	.0107	.0031	
8,208	36,000	.0117	.....	
8,436	37,000	.0127	.....	
8,664	38,000	.0149	.....	
8,892	39,000	.0189	.....	
9,120	40,000	.0238	.0140	
9,348	41,000	.0321	.....	
9,576	42,000	.0546	.....	
9,804	43,000	.0785	.....	
10,032	44,000	.1038	.....	
10,260	45,000	.14	.....	
10,488	46,000	.18	.....	
10,716	47,000	.22	.....	
10,944	48,000	.23	.....	
11,172	49,000	.31	.....	
11,400	50,000	.38	.....	
11,628	51,000	.44	.....	
11,856	52,000	.52	.....	
12,084	53,000	.68	.....	
12,312	54,000	.83	.....	
12,380	54,298	.....	.....	Tensile strength.

No. 700.

No. 1.—*Drawn copper, uncompressed.*

Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
200	1,000	0.	0.	Initial load.
1,000	5,000	.0006	0.	
2,000	10,000	.0016	0.	
2,400	12,000	.0022	.....	
2,800	14,000	.0026	.....	
3,000	15,000	.0027	.0002	
3,200	16,000	.0029	.....	
3,400	17,000	.0031	.....	
3,600	18,000	.0033	.....	
3,800	19,000	.0035	.....	
4,000	20,000	.0037	.0002	
4,200	21,000	.0037	.....	
4,400	22,000	.0041	.....	
4,600	23,000	.0044	.....	
4,800	24,000	.0046	.....	
5,000	25,000	.0047	.0004	
5,200	26,000	.0052	.....	
5,400	27,000	.0055	.....	
5,600	28,000	.0061	.....	
5,800	29,000	.0067	.....	
6,000	30,000	.0083	.0027	
6,200	31,000	.0250	.....	
6,400	32,000	.1185	.....	
6,600	33,000	.25	.....	
6,800	34,000	.47	.....	
6,880	34,400	.90	.....	Tensile strength.
0	0	1.05	.....	=35.0 per cent.

Elongation of inch sections, * ″.49, ″.36, ″.21.
Diameter at fracture, ″.32.
Area, .080 square inch.
Contraction, 60.0 per cent.
Fractured 1″.2 from neck. Appearance, fine, silky.

No. 732.

No. 1 C.—*Copper, compressed.*

Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 3″.00

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
200	1,000	0.	0.	Initial load.
1,000	5,000	.0006	0.	
2,000	10,000	.0014	0.	
3,000	15,000	.0021	.0001	
3,200	16,000	.0025	.....	
3,400	17,000	.0027	.....	
3,600	18,000	.0029	.....	
3,800	19,000	.0031	.....	
4,000	20,000	.0034	.0002	
4,200	21,000	.0036	.....	
4,400	22,000	.0038	.....	
4,600	23,000	.0042	.....	
4,800	24,000	.0045	.....	
5,000	25,000	.0047	.0005	
5,200	26,000	.0052	.....	
5,400	27,000	.0056	.....	
5,600	28,000	.0061	.....	
5,800	29,000	.0071	.....	
6,000	30,000	.0101	.0046	
6,200	31,000	.0594	.....	
6,400	32,000	.1650	.....	
6,600	33,000	.31	.....	
6,800	34,000	.53	.....	
6,830	34,150	.79	.....	Tensile strength.
5,300	.....	.....	.....	Load at time of rupture.
0	0	1.19	.....	=39.7 per cent.

Elongation of inch sections, ″.39, *″.53, ″.27.
Diameter at fracture, ″.30.
Area, .0707 square inch.
Contraction, 64.7 per cent.
Fractured 1″.50 from neck. Appearance, fine, silky.

No. 699.

No. 1.—*Banca tin, uncompressed.*

Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
200	1,000	0.	0.	Initial load.
		.0011	.....	After 5 minutes' rest.
300	1,500	.0075	.....	Immediate elongation.
		.0188	.....	After 5 minutes' rest.
400	2,000	.0290	.....	
		.0861	.....	
500	2,500	.1175	.....	
		.2825	.....	
600	3,000	.40	.....	Tensile strength.
		1.92	.....	After 4½ minutes' rest.
0	0	2.03	.....	=67.7 per cent.

Elongation of inch sections, ″.51, ″.53, *″.99.
Diameter at fracture, about ″.15.
Area, .018 square inch.
Contraction, 91.0 per cent.
Fractured 1″.10 from neck.

No. 734.

No. 1 C.—*Banca tin, compressed.*

Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
200	1,000	0.	0.	Initial load.
		.0007	.....	After 5 minutes' rest.
300	1,500	.0050	.....	
		.0199	.....	Do.
400	2,000	.0321	.....	
		.1000	.....	Do.
500	2,500	.13	.....	
		.385	.....	Do.
600	3,000	.49	.....	Tensile strength.
		1.21	.....	After 2½ minutes' rest.
0	0	2.12	.....	=70.7 per cent.

Elongation of inch sections, *″.77, ″.80, ″.55.
Diameter at fracture, about ″.09.
Area, .0063 square inch.
Contraction, 96.8 per cent.
Fractured 1½″ from neck.

No. 701.

No. 1.—*Lead, uncompressed.*

Diameter, ″.500.
Sectional area, .196 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
98	500	0.	0.	Initial load.
196	1,000	.0182	.....	Immediate elongation.
		.0238	.....	After 5 minutes' rest.
294	1,500	.1340	.....	
		.1371	.....	
392	2,000	.32	.....	
		.49	.....	
464	2,367	1.10	.....	Tensile strength,
0	0	1.34	.....	=44.7 per cent.

Elongation of inch sections, *″.75, ″.29, ″.30.
Diameter at fracture, ″.13.
Area, .013 square inch.
Contraction, 93.4 per cent.
Fractured 1″.30 from neck.

No. 736.

No. 1 C.—*Lead, compressed.*

Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
100	500	0.	0.	Initial load.
200	1,000	.0006	.....	
		.0007	.....	After 5 minutes' rest.
300	1,500	.0061	.....	
		.0073	.....	
400	2,000	.0448	.....	
		.0468	.....	
500	2,500	.1231	.....	
		.1364	.....	
600	3,000	.240	.....	
		.346	.....	
700	3,500	.80	.....	Tensile strength.
		1.20	.....	After 2 minutes' rest.
0	0	1.40	.....	=46.7 per cent.

Elongation of inch sections, ″.33, ″.37, *″.70.
Diameter at fracture, about ″.16.
Area, .0201 square inch.
Contraction, 89.9 per cent.
Fracture, ″.90 from neck.
Cylindrical surface of stem fine mottled.

No. 744.

Silecian zinc, 1C, *compressed.*

Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	Initial load.
400	2,000	.0004	.....	
600	3,000	.0031	.....	
660	3,300	.....	.....	Tensile strength.

Fractured ″.3 from neck. Appearance, granular.

DETAILS OF COMPRESSION TESTS.

No. 773.

Mild steel, uncompressed.

Mark, No. 2.
Total length, 5″.52.
Diameter, ″.800.
Sectional area, .503 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
503	1,000	0.	0.	Initial load.
2,515	5,000	.0003	0.	
5,030	10,000	.0009	0.	
7,545	15,000	.0012	0.	
10,060	20,000	.0017	0.	
12,575	25,000	.0022	0.	
15,090	30,000	.0027	0.	
17,605	35,000	.0034	0.	
18,108	36,000	.0035	.....	
18,611	37,000	.0036	.....	Elastic limit.
19,114	38,000	.0038	.....	
19,617	39,000	.0050	.....	
20,120	40,000	.0175	.....	
20,623	41,000	.0493	.....	
26,240	52,167	.....	.....	Ultimate strength.

Failed by triple flexure.
Bent 180° without cracks.

No. 731.

Mild steel, compressed.

Mark, 4.
Total length, 5″.510.
Diameter, ″.7998.
Sectional area, .503 square inch.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
503	1,000	0.	0.	Initial load.
2,515	5,000	.0001	—.0001	
5,030	10,000	.0005	—.0001	
7,545	15,000	.0010	—.0001	
10,060	20,000	.0015	—.0001	
12,575	25,000	.0020	—.0001	
15,090	30,000	.0025	—.0001	
17,605	35,000	.0029	—.0001	
18,108	36,000	.0039	.....	
18,611	37,000	.0033	.....	
19,114	38,000	.0035	.....	Elastic limit.
19,617	39,000	.0043	.....	
20,120	40,000	.0110	.....	
20,623	41,000	.0220	.....	
27,280	54,234	.....	.....	Ultimate strength.

Failed by triple flexure.
Bent 180° without cracks.

No. 772.

No. 4.—*Wrought-iron, uncompressed.*

Total length, 5″.515.
Diameter, ″.819.
Sectional area, .527 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
527	1,000	0.	0.	Initial load.
2,635	5,000	.0005	0.	
5,270	10,000	.0010	0.	
7,905	15,000	.0015	0.	
10,540	20,000	.0020	0.	
13,175	25,000	.0026	.0001	
13,702	26,000	.0028	.....	
14,229	27,000	.0030	.....	
14,756	28,000	.0031	.....	Elastic limit.
15,283	29,000	.0037	.....	
15,810	30,000	.0110	.0081	
16,337	31,000	.0200	.....	
16,864	32,000	.0216	.....	
22,900	43,454	.....	.....	Ultimate strength.

Failed by triple flexure.
Bent 180° without cracks.

No. 729.

No. 2.—*Wrought-iron, compressed.*

Original dimensions:
Length, 5″.510.
Diameter, ″.750.
Sectional area, .442 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
442	1,000	0.	0.	Initial load.
2,210	5,000	.0005	0.	
4,420	10,000	.0009	0.	
6,630	15,000	.0014	0.	
8,840	20,000	.0019	0.	
11,050	25,000	.0024	0.	
11,492	26,000	.0025	.....	
11,934	27,000	.0026	.....	
12,376	28,000	.0028	.....	
12,818	29,000	.0029	.....	
13,260	30,000	.0030	.0001	
13,702	31,000	.0032	.....	
14,144	32,000	.0033	.....	
14,586	33,000	.0036	.....	
15,028	34,000	.0040	.....	Elastic limit.
15,470	35,000	.0092	.0063	
15,912	36,000	.1376	.....	
21,100	47,737	.....	.....	Ultimate strength.

Failed by triple flexure.
Bent 180° without cracks.

No. 777.

Cast-iron, uncompressed.

Marks, $\frac{12T}{C_4}$
Total length, 5″.46.
Diameter, ″.750.
Sectional area, .442 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
442	1,000	0.	0.	Initial load.
884	2,000	6.	.....	
1,326	3,000	.0002	.....	
1,768	4,000	.0004	.....	
2,210	5,000	.0006	0.	
2,652	6,000	.0007	.....	
3,094	7,000	.0008	.....	
3,536	8,000	.0010	.....	
3,978	9,000	.0012	.....	
4,420	10,000	.0013	0.	
4,862	11,000	.0015	.....	
5,304	12,000	.0016	.....	
5,746	13,000	.0017	.....	
6,188	14,000	.0019	.....	
6,630	15,000	.0021	.0001	
7,072	16,000	.0022	.....	
7,514	17,000	.0023	.....	
7,956	18,000	.0025	.....	
8,398	19,000	.0027	.....	
8,840	20,000	.0029	.0002	
9,282	21,000	.0030	.....	
9,724	22,000	.0032	.....	
10,166	23,000	.0034	.....	
10,608	24,000	.0036	.....	
11,050	25,000	.0038	.0003	
11,492	26,000	.0041	.....	
11,934	27,000	.0043	.....	
12,376	28,000	.0046	.....	
12,818	29,000	.0050	.....	
13,260	30,000	.0054	.0011	
13,702	31,000	.0057	.....	
14,144	32,000	.0061	.....	
14,586	33,000	.0069	.....	
15,028	34,000	.0075	.....	
15,470	35,000	.0085	.0033	
15,912	36,000	.0091	.....	
16,354	37,000	.0100	.....	
16,796	38,000	.0111	.....	
17,238	39,000	.0125	.....	
17,680	40,000	.0140	.0079	
18,122	41,000	.0153	.....	
18,564	42,000	.0161	.....	
19,006	43,000	.0175	.....	
19,448	44,000	.0194	.....	
19,890	45,000	.0207	.0137	
20,332	46,000	.0222	.....	
20,774	47,000	.0235	.....	
21,216	48,000	.0248	.....	
21,658	49,000	.0262	.....	
22,100	50,000	.0280	.0201	
22,542	51,000	.0293	.....	
22,984	52,000	.0311	.....	
23,426	53,000	.0321	.....	
23,868	54,000	.0335	.....	
24,310	55,000	.0355	.0265	
24,752	56,000	.0365	.....	
25,194	57,000	.0375	.....	
25,636	58,000	.0386	.....	
26,078	59,000	.0400	.....	
26,520	60,000	.0410	.0316	
26,962	61,000	.0418	.....	
27,404	62,000	.0425	.....	Rapid deflection, convex on micrometer side of specimen.
27,846	63,000	.0425	.....	
28,288	64,000	.0419	.....	
28,730	65,000	.0407	.0312	
33,700	76,244	.....	.....	Ultimate strength.

Triple flexure,

No. 739.

Cast-iron, compressed.

Marks, $\frac{12T}{c4}$
Total length, 5″.482.
Diameter, ″.7494.
Sectional area, .441 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
441	1,000	0.	0.	Initial load.
882	2,000	.0002	.....	
1,323	3,000	.0002	.....	
1,764	4,000	.0004	.....	
2,205	5,000	.0005	0.	
2,646	6,000	.0007	.....	
3,087	7,000	.0009	.....	
3,528	8,000	.0011	.....	
3,969	9,000	.0012	.....	
4,410	10,000	.0014	0.	
4,851	11,000	.0015	.....	
5,292	12,000	.0017	.....	
5,733	13,000	.0019	.....	
6,174	14,000	.0020	.....	
6,615	15,000	.0021	0.	
7,056	16,000	.0022	.....	
7,497	17,000	.0024	.....	
7,938	18,000	.0025	.....	
8,379	19,000	.0026	.....	
8,820	20,000	.0028	.0001	
9,261	21,000	.0030	.....	
9,702	22,000	.0033	.....	
10,143	23,000	.0035	.....	
10,584	24,000	.0036	.....	
11,025	25,000	.0039	.0003	
11,466	26,000	.0040	.....	
11,907	27,000	.0043	.....	
12,348	28,000	.0046	.....	
12,789	29,000	.0048	.....	
13,230	30,000	.0052	.0009	
13,671	31,000	.0055	.....	
14,112	32,000	.0059	.....	
14,553	33,000	.0065	.....	
14,994	34,000	.0070	.....	
15,435	35,000	.0075	.0024	
15,876	36,000	.0084	.....	
16,317	37,000	.0094	.....	
16,758	38,000	.0103	.....	
17,199	39,000	.0116	.....	
17,640	40,000	.0127	.0066	
18,081	41,000	.0136	.....	
18,522	42,000	.0152	.....	
18,963	43,000	.0166	.....	
19,404	44,000	.0183	.....	
19,845	45,000	.0200	.0130	
20,286	46,000	.0216	.....	
20,727	47,000	.0231	.....	
21,168	48,000	.0246	.....	
21,609	49,000	.0270	.....	
22,050	50,000	.0288	.0207	
22,491	51,000	.0306	.....	
22,932	52,000	.0319	.....	
23,373	53,000	.0349	.....	
23,814	54,000	.0364	.....	
24,255	55,000	.0390	.0295	
24,696	56,000	.0410	.....	
25,137	57,000	.0431	.....	
25,578	58,000	.0458	.....	
26,019	59,000	.0488	.....	
26,460	60,000	.0521	.0406	
26,901	61,000	.0538	.....	
27,342	62,000	.0569	.....	

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
27,783	63,000	.0607	.....	
28,224	64,000	.0671	.....	
28,665	65,000	.0700	.....	
29,106	66,000	.0775	.....	
29,547	67,000	.0863	.....	
29,988	68,000	.0917	.....	
33,800	76,643	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 771.

Drawn brass, uncompressed.

Total length, 5″.495.
Diameter, ″.740.
Sectional area, .44 square inch.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
430	1,000	0.	0.	Initial load.
2,150	5,000	.0008	0.	
4,300	10,000	.0017	0.	
6,450	15,000	.0026	0.	
8,600	20,000	.0036	0.	
10,750	25,000	.0046	0.	
12,900	30,000	.0062	.0007	
13,330	31,000	.0065	.....	
13,760	32,000	.0071	.....	
14,190	33,000	.0078	.....	
14,620	34,000	.0085	.....	
15,050	35,000	.0096	.0030	
15,480	36,000	.0104	.....	
15,910	37,000	.0121	.....	
16,340	38,000	.0137	.....	
16,770	39,000	.0164	.....	
17,200	40,000	.0195	.0110	
18,060	42,000	.....	.....	Ultimate strength.

Failed by triple flexure.
Bent 180° without cracks.

No. 727.

Drawn brass, compressed.

Total length, 5″.507.
Diameter, ″.750.
Sectional area, .442 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
442	1,000	0.	0.	Initial load.
2,210	5,000	.0010	.0001	
4,420	10,000	.0020	.0001	
6,630	15,000	.0031	.0003	
8,840	20,000	.0041	.0003	
11,050	25,000	.0052	.0005	
13,260	30,000	.0068	.0008	
13,702	31,000	.0068	.....	
14,144	32,000	.0071	.....	
14,586	33,000	.0075	.....	
15,028	34,000	.0080	.....	
15,470	35,000	.0086	.0015	
15,912	36,000	.0090	.....	
16,354	37,000	.0102	.....	
16,796	38,000	.0118	.....	
17,238	39,000	.0128	.....	
17,680	40,000	.0143	.0057	
18,122	41,000	.0158	.....	
18,564	42,000	.0178	.....	
19,006	43,000	.0201	.....	
19,448	44,000	.0220	.....	
19,890	45,000	.0250	.....	
23,580	53,348	.....	.....	Ultimate strength.

Failed by triple flexure.
Bent 180° without cracks.

No. 774.

Drawn copper, uncompressed.

Total length, 5″.50.
Diameter, ″.750.
Sectional area, .442 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
442	1,000	0.	0.	Initial load.
2,210	5,000	.0005	0.	
4,520	10,000	.0015	0.	
6,630	15,000	.0028	0.	
8,940	20,000	.0040	.0004	
9,282	21,000	.0044	.....	
9,724	22,000	.0048	.....	
10,156	23,000	.0051	.....	
10,608	24,000	.0056	.....	
11,050	25,000	.0061	.0015	
11,492	26,000	.0067	.....	
11,934	27,000	.0076	.....	
12,376	28,000	.0085	.....	
12,818	29,000	.0095	.....	
13,260	30,000	.0111	.0056	
13,702	31,000	.0183	.....	
13,880	31,402	.....	.....	Ultimate strength.

Failed by triple flexure.
Bent 180° without cracks.

No. 733.

Drawn copper, compressed.

Total length, 5″.510.
Diameter, ″.7501.
Sectional area, .442 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
442	1,000	0.	0.	Initial load.
2,210	5,000	.0007	0.	
4,420	10,000	.0016	0.	
6,630	15,000	.0027	.0001	
8,840	20,000	.0040	.0006	
9,282	21,000	.0045	.....	
9,724	22,000	.0049	.....	
10,166	23,000	.0053	.....	
10,608	24,000	.0058	.....	
11,050	25,000	.0063	.0019	
11,492	26,000	.0071	.....	
11,934	27,000	.0080	.....	
12,376	28,000	.0090	.....	
12,818	29,000	.0105	.....	
13,260	30,000	.0133	.0071	
13,860	31,359	.....	.....	Ultimate strength.

Failed by triple flexure.
Bent 180° without cracks.

No. 775.

Banca tin, uncompressed.

Total length, 5′.5.
Diameter, ″.750.
Sectional area, .442 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
442	1,000	0.	0.	Initial load.
884	2,000	.0140	.....	After 1 minute.
		.0260	.....	After 2 minutes.
1,220	2,760	.....	.....	Ultimate strength.

Failed by triple flexure.
Bent 180° without cracks.

No. 735.

Banca tin, compressed.

Total length, 5″.497.
Diameter, ″.7502.
Sectional area, .442 square inch.
Gauged length, 3″.00.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
442	1,000	0.	0.	Initial load.
884	2,000	.0400	.....	After 1 minute.
		.9965	.....	
1,120	2,533	.....	.....	Ultimate strength.

Failed by triple flexure.
Bent 180° without cracks. Mottled surface finer than the uncompressed specimen.

No. 776.

Lead, uncompressed.

Total length, 5″.50.
Diameter, ″.750.
Sectional area, .442 square inch.
Ultimate strength, 1,010 pounds=2,285 pounds per square inch.
Failed by triple flexure. Coarse mottled surface. Bent 180° without fracture.

No. 737.

Lead, compressed.

Total length, 5″.502.
Diameter, ″.7491.
Sectional area, .441 square inch.
Ultimate strength, 1,170 pounds=2,653 pounds per square inch.
Failed by triple flexure. Fine mottled surface. Bent 180° without fracture.

No. 740.

White pine, compressed.

Original dimensions:
Length, 5″.506.
Diameter, ″.743.
Sectional area, .434 square inch.
Crushing strength, 2,390 pounds=5,507 pounds per square inch.
Fibers crushed at end of stick.

No. 742.

White oak, compressed

Original dimensions:
Length, 5″.522.
Diameter, ″.740.
Sectional area, .43 square inch.
Crushing strength, 3,460 pounds=8,046 pounds per square inch.
Failed by deflection at middle of length.

Tabulation of results with cubic compression specimens.

Material.	Tension tests.					
	Elastic limit.		Tensile strength.		Elongation.	
	Not compressed.	Compressed.	Not compressed.	Compressed.	Not compressed.	Compressed.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Per cent.*	*Per cent.*
Mild steel	44,000	43,000	66,250	64,300	27.7	27.7
Wrought-iron	31,000	27,000	54,200	55,450	27.7	25.0
Cast-iron			25,000	23,400		
Drawn brass	33,000	33,000	54,385	54,298		
Drawn copper			34,400	34,150	35.0	39.7
Banca tin			3,000	3,000	67.7	70.7
Lead			2,367	3,500	44.7	46.7
Silesian zinc			3,300			
White pine						
White oak						

Material.	Tension tests.				Compression tests (ultimate strength).	
	Contraction of area.		Appearance of fracture.			
	Not compressed.	Compressed.	Not compressed.	Compressed.	Not compressed.	Compressed.
	Per cent.	*Per cent.*			*Pounds.*	*Pounds.*
Mild steel	57.2	62.2	Fine, silky	Fine, silky	52,167	54,234
Wrought-iron	46.2	40.3	Fine, fibrous	Fine, fibrous	43,454	47,737
Cast-iron			Granular, mottled.	Granular, mottled.	76,244	76,643
Drawn brass					42,000	53,348
Drawn copper	60.0	64.7	Fine, silky	Fine, silky	31,402	31,359
Banca tin	91.0	96.8			2,760	2,533
Lead	93.4	89.9			2,285	2,653
Silesian zinc			Granular			
White pine						5,507
White oak						8,046

COMPRESSION OF BRICK PIERS.

1689

COMPRESSION OF BRICK PIERS

This series comprises the tests of fifty-three piers, the cross-section dimensions of which range from 8″×8″ to 16″×16″, and the heights from 2 feet to 12½ feet.

Two kinds of bricks were used in their construction—common, hard burnt and face bricks, laid on bed with joints broken every course.

The mortar was composed of one part Rosendale cement and two parts sand.

The piers were built in September, 1884, and were twenty-one months old when tested; in the mean time they had seasoned in a dry, cool building.

Tests of the individual bricks are found in the Report of Tests, 1885.

An earlier series of tests (see Report, 1884) showed the strength of piers as modified by mortars of different composition. In the present series it was intended that the mortar should be the same throughout, and the variations in strength developed depend upon the dimensions of the piers. The mortar, however, was found to vary in quality, and much stronger in some places than others.

The piers were transported from the building in which they were built and seasoned to the testing machine in a fixture consisting of two flat plates placed over the ends of the piers and connected by side rods which were provided with turn-buckles. Tightening the buckles, the piers were put in a state of compression sufficient to enable them to be handled without injury. After adjustment in the testing machine the tension of the side rods was released; but the tension of these rods being greater than the initial load at the commencement of the test, the early compression measurements were doubtless affected thereby.

Piers 4 feet and less in height were handled without plates and rods, hence the recorded compression of these piers is the normal amount from the initial load upward.

Loads were gradually applied and compression measurements taken after equal increments, thus proceeding till the maximum load was reached which the pier was capable of sustaining. Tests were discontinued after the maximum load had been passed, the resistance of the pier falling off as cracks in the brick-work became general.

The failure of a pier takes place in detail, cracks occurring under loads much below the maximum, and which continue to increase in size and number as the loads advance.

There was tendency in many of the piers to crack first in the upper courses; the irregularity of strength thus indicated was attributed to the consolidation which the mortar in the lower courses receives when first laid, from the weight of the brick-work above.

As described in a previous report, cracks are opened in a longitudinal direction, that is, parallel to the axis of the pier, and appear first through the middle of the length of the solid brick opposite the end joints of the adjacent courses.

The efficiency of each pier is given in the tabulation in per centum of the strength of single bricks—the average crushing strength of three face bricks was 13,353 pounds per square inch, and of five common bricks, 15,818 pounds per square inch.

A diagram follows, showing the relative strength of the piers tested, in which the abscissas represent the total height in feet, and the ordinates the crushing strength in pounds per square inch.

An inspection of the diagram shows the strength of piers to depend upon their total heights, also upon their sectional areas, from which it follows that volume is a function of the ultimate resistance.

Increasing the height or enlarging the cross-section dimensions effects a reduction in resistance.

Piers with bond-stones have a strength intermediate between the strength of a pier of their total height and those of the height between bond-stones.

The quality of the grout in the grouted piers was not satisfactory, being soft and easily crumbled; these piers showed inferior resistance doubtless from this cause.

Very low strength is displayed in the 12-inch face-brick pier with hollow core, which was laid without mortar. A weak mortar assists materially in distributing the stress over the bed surface of the brick, which is concentrated at few points when the pier is laid dry.

Crushing strength of cubes and prisms representing the mortar used in the construction of the brick piers. Age when tested, 17 months.

CUBES.

No. of test.	Composition.	Dimensions.			Sectional area.	Ultimate strength.		Weight per cubic foot.	Remarks.
		Height.	Compressed surface.			Total.	Per sq. inch.		
		Inches.	*Ins.*	*Ins.*	*Sq.inch.*	*Pounds*	*Pounds*	*Pounds.*	
721	1 part cement, 2 parts sand.	6.11	5.95	5.90	35.105	5,520	157	108.7	Pyramidal fracture.
722	....do.....	6.17	5.98	5.91	35.340	5,600	158	107.0	Do.
723	....do.....	6.22	5.90	5.93	34.987	5,810	166	107.6	Do.

PRISMS.

724	1 part cement, 2 parts sand.	17.97	5.95	5.96	35.46	5,200	147	104.3	Pyramidal fracture.
725	....do.....	17.98	5.95	5.96	35.46	5,420	153	105.7	Do.
726	....do.....	18.03	5.97	5.96	35.58	5,300	149	106.4	Do.

DETAILS OF TESTS OF MORTAR AND BRICK PIERS.

No. 724.

Height, 17″.97.
Compressed surface, 5″.95×5″.96=35.46 square inches.
Gauged length, 15″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	.....	0.	0.	Initial load.
1,000	.....	.0015	.....	
1,500	.....	.0031	.....	
2,000	.....	.0047	.0014	
2,500	.....	.0064	.....	
3,000	.....	.0080	.0025	
3,500	.....	.0098	.....	
4,000	.....	.0116	.0047	
4,500	.....	.0145	.....	
5,000	.....	.0200	.0099	
5,200	147	.....	.....	Crushing strength.
.....	.....	.....	.....	Pyramidal fracture.

No. 725.

Height, 17″.98.
Compressed surface, 5″.95×5″.96=35.46 square inches.
Gauged length, 15″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	.....	0.	0.	Initial load.
1,000	.....	.0005	.....	
1,500	.....	.0017	.....	
2,000	.....	.0027	.0001	
2,500	.....	.0040	.....	
3,000	.....	.0053	.0006	
3,500	.....	.0072	.....	
4,000	.....	.0090	.0019	
4,500	.....	.0115	.....	
5,000	.....	.0157	.0035	
5,000	.....	.0170	.....	Reading after taking set.
5,420	153	.....	.....	Crushing strength.

No. 726.

Height, 18″.03.
Compressed surface, 5″.97×5″.96=35.58 square inches.
Gauged length, 15″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	.....	0.	0.	Initial load.
1,000	.....	.0007	.....	
1,500	.....	.0018	.....	
2,000	.....	.0028	.0004	
2,500	.....	.0038	.....	
3,000	.....	.0052	.0015	
3,500	.....	.0071	.....	
4,000	.....	.0095	.0035	
4,500	.....	.0128	.....	
5,000	.....	.0176	.0081	
5,300	149	.....	.....	Crushing strength.

No. 851.

8-inch brick pier.

Built of ten courses of face brick.
Total weight, 107 pounds.
Weight per cubic foot, 132.7 pounds.
Total height, 24″.
Sectional area, 7″.61×7″.63=58.06 square inches.
Average thickness of joints, ″.22.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
138,000	.....	.....	.....	Cracks.
141,000	2,428	.....	.....	Ultimate strength.

Opened longitudinal seams and crushed the bricks.

No. 852.

8-inch brick pier.

Built of ten courses of face brick.
Total weight, 110 pounds.
Weight per cubic foot, 134.4 pounds.
Total height, 24″.27.
Sectional area, 7″.64×7″.63=58.29 square inches.
Average thickness of joints, ″.23.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
116,000	.....	.....	.....	Cracks.
123,400	2,117	.....	.....	Ultimate strength.

Opened longitudinal seams and crushed bricks in end course.

No. 853.

8-inch brick pier.

Built of twenty courses of face brick.
Total weight, 215 pounds.
Weight per cubic foot, 130.2 pounds.
Total height, 47″.95.
Sectional area, 7″.68×7″.75=59.52 square inches.
Average thickness of joints, ″.21.
Gauged length, ″.40.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
5,952	100	0.	0.	Initial load.
8,928	150	.0017	.....	
11,904	200	.0034	.....	
14,880	250	.0051	.....	
17,856	300	.0069	.....	
20,832	350	.0089	.....	
23,808	400	.0111	.....	
26,784	450	.0133	.....	
29,760	500	.0159	.0041	
32,736	550	.0180	.....	
35,712	600	.0210	.....	
38,688	650	.0238	.....	
41,664	700	.0269	.....	
44,664	750	.0300	.....	
47,616	800	.0345	.....	
50,592	850	.0383	.....	
53,568	900	.0422	.....	
56,544	950	.0469	.....	
59,520	1,000	.0517	.0219	
62,496	1,050	.0583	.....	
65,472	1,100	.0619	.....	
68,448	1,150	.0660	.....	
71,424	1,200	.0719	.....	
74,400	1,250	.0770	.....	
77,376	1,300	.0809	.....	
80,352	1,350	.0880	.....	
83,328	1,400	.0949	.....	
86,304	1,450	.1006	.....	
89,280	1,500	.1059	.....	
92,256	1,550	.1134	.....	
95,232	1,600	.1168	.....	Piece flaked off brick near middle of height.
98,208	1,650	.1220	.....	Sustained this load 3 minutes.
101,184	1,700	.1310	.....	
104,160	1,750	.1380	.....	
107,136	1,800	.1448	.....	
110,112	1,850	.1523	.....	
113,088	1,900	.1580	.....	Cracks near ends of pier.
116,064	1,950	.1658	.....	
119,040	2,000	.1760	.....	
122,016	2,050	.1930	.....	Ultimate strength.

No. 854.

8-inch brick pier.

Built of twenty courses of face brick.
Total weight, 215 pounds.
Weight per cubic foot, 129.7 pounds.
Total height, 48″.
Sectional area, 7″.75×7″.70=59.68 square inches.
Average thickness of joints, ″.22.
Gauged length, 40″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
5,968	100	0.	0.	Initial load.
8,952	150	.0019	.....	
11,936	200	.0039	.....	
14,920	250	.0061	.....	
17,904	300	.0088	.....	
20,888	350	.0121	.....	
23,872	400	.0153	.....	
26,856	450	.0193	.....	
29,840	500	.0243	.0108	
32,824	550	.0298	.....	
35,808	600	.0342	.....	
38,792	650	.0396	.....	
41,776	700	.0467	.....	
44,760	750	.0533	.....	
47,744	800	.0500	.....	
50,728	850	.0562	.....	
53,712	900	.0730	.....	
56,696	950	.0806	.....	
59,680	1,000	.0887	.0523	
62,664	1,050	.0990	.....	
65,648	1,100	.1025	.....	
68,632	1,150	.1097	.....	
71,616	1,200	.1165	.....	
74,600	1,250	.1217	.....	
77,584	1,300	.1292	.....	
80,568	1,350	.1350	.....	
83,552	1,400	.1417	.....	
86,536	1,450	.1498	.....	Rested 3 minutes.
89,520	1,500	.1612	.....	
92,504	1,550	.1648	.....	
95,488	1,600	.1702	.....	Rested 2 minutes.
98,472	1,650	.1800	.....	
101,456	1,700	.1850	.....	
104,440	1,750	.1931	.....	
107,424	1,800	.2017	.....	
110,408	1,850	.2085	.....	
113,392	1,900	.2226	.....	Cracks appear in middle courses.
116,000	1,944	.....	.....	Ultimate strength.

No. 855.

8-inch brick pier.

Built of thirty courses of face brick.
Total weight, 321 pounds.
Weight per cubic foot, 127.6 pounds.
Total height, 72″.37.
Sectional area, 7″.75×7″.75=60.06 square inches.
Average thickness of joints, ″.22.
Gauged length, 60″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,009	150	0.	0.	Initial load.
12,012	200	.0000	.....	
15,015	250	.0025	.....	
18,018	300	.0050	.....	
21,021	350	.0090	.....	
24,024	400	.0140	.....	
27,027	450	.0220	.....	
30,030	500	.0290	.0130	
33,033	550	.0380	.....	
36,036	600	.0450	.....	
39,039	650	.0560	.....	
42,042	700	.0660	.0395	
45,045	750	.0793	.....	
48,048	800	.0885	.....	
51,051	850	.1015	.....	
54,054	900	.1130	.....	
57,057	950	.1250	.....	
60,060	1,000	.1370	.0935	
63,063	1,050	.1530	.....	
66,066	1,100	.1620	.....	
69,069	1,150	.1740	.....	
72,072	1,200	.1890	.....	
75,075	1,250	.2015	.....	
78,078	1,300	.2135	.....	
81,081	1,350	.2260	.....	
84,084	1,400	.2410	.....	
87,087	1,450	.2530	.....	Cracks in sight.
90,090	1,500	.2650	.....	
93,093	1,550	.2790	.....	
96,096	1,600	.2900	.....	
99,099	1,650	.3020	.....	
102,102	1,700	.3190	.....	
105,105	1,750	.3310	.....	
108,108	1,800	.3440	.....	
111,111	1,850	.3580	.....	
114,114	1,900	.3740	.....	
117,117	1,950	.3940	.....	Ultimate strength.

Principal fractures confined to the lower half of the pier.

No. 856.

8-inch brick pier.

Built of thirty courses of face brick.
Total weight, 330 pounds.
Weight per cubic foot, 129.6 pounds.
Total height, 72″.26.
Sectional area, 7″.75 × 7.″85 = 60.84 square inches.
Average thickness of joints, ″.20.
Gauged length, 60″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,126	150	0.	0.	Initial load.
12,168	200	.0020	.....	
15,210	250	.0050	.....	
18,252	300	.0113	.....	
21,294	350	.0180	.....	
24,336	400	.0265	.....	
27,378	450	.0360	.....	
30,420	500	.0475	.0295	
33,462	550	.0600	.....	
36,504	600	.0710	.....	
39,546	650	.0860	.....	
42,588	700	.1020	.0720	
45,630	750	.1170	.....	
48,672	800	.1310	.....	
51,714	850	.1410	.....	
54,756	900	.1560	.....	
57,798	950	.1710	.....	
60,840	1,000	.1890	.1410	
63,882	1,050	.2045	.....	
66,924	1,100	.2160	.....	
69,966	1,150	.2280	.....	
73,008	1,200	.2420	.....	
76,050	1,250	.2570	.....	
79,092	1,300	.2680	.....	
82,134	1,350	.2770	.....	
85,176	1,400	.2990	.....	
88,218	1,450	.3117	.....	Cracks.
91,260	1,500	.3250	.....	
94,302	1,550	.3405	.....	
97,344	1,600	.3580	.....	
100,386	1,650	.3780	.....	
103,428	1,700	.3930	.....	
106,470	1,750	.4260	.....	Ultimate strength.

Crushed the bricks in the middle courses.

No. 857.

8-inch brick pier.

Built of forty courses of face brick.
Total weight, 422 pounds.
Weight per cubic foot, 125.2 pounds.
Total height, 96″.56
Sectional area, 7″.78×7″.75=60.30 square inches.
Average thickness of joints, ″.23
Gauged length, 80″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,045	150	0.	0.	Initial load.
12,060	200	.0030	.....	
15,075	250	.0062	.....	
18,090	300	.0110	.....	
21,105	350	.0210	.....	
24,120	400	.0350	.....	
27,135	450	.0480	.....	
30,150	500	.0655	.0412	
33,165	550	.0805	.....	
36,180	600	.0995	.....	
39,195	650	.1180	.....	
42,210	700	.1360	.0960	
45,225	750	.1540	.....	
48,240	800	.1710	.....	
51,255	850	.1890	.....	
54,270	900	.2090	.....	
57,285	950	.2310	.....	
60,300	1,000	.2490	.1850	
63,315	1,050	.2740	.....	
66,330	1,100	.2865	.....	
69,345	1,150	.3020	.....	
72,360	1,200	.3230	.....	
75,375	1,250	.3410	.....	
78,390	1,300	.3570	.....	
81,405	1,350	.3750	.....	Cracks at middle of height.
84,420	1,400	.3960	.....	
87,435	1,450	.4135	.....	
90,450	1,500	.4310	.....	
93,465	1,550	.4580	.....	
96,480	1,600	.4760	.....	
99,495	1,650	.5000	.....	
102,000	1,691	.5470	.....	Ultimate strength.

Partially crushed bricks in the eighth and ninth courses from the top, and opened longitudinal seams near the lower end.

No. 858.

8-inch brick pier.

Built of fifty courses of face brick.
Total height, 119″.27.
Sectional area, 7″.80 × 7″.70 = 60.06 square inches.
Average thickness of joints, ″.23.
Gauged length, 100″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
9,159	152	0.	.....	Initial load.
12,212	203	.0039	.....	
15,265	254	.0068	.....	
18,318	305	.0134	.....	
21,371	356	.0230	.....	
24,424	407	.0363	.....	
27,477	457	.0519	.....	
30,530	508	.0703	.0412	
33,583	559	.0903	.....	
36,636	609	.1078	.....	
39,689	660	.1260	.....	
42,742	712	.1455	.0958	
45,795	762	.1725	.....	
48,848	813	.1880	.....	
51,901	864	.2080	.....	
54,954	915	.2287	.....	
58,007	966	.2498	.....	
61,060	1,017	.2710	.1910	
64,113	1,067	.2976	.....	
67,166	1,118	.3130	.....	
70,219	1,169	.3300	.....	
73,272	1,220	.3539	.....	
76,325	1,271	.3830	.....	
79,378	1,322	.3990	.....	
82,431	1,372	.4147	.....	
85,484	1,423	.4412	.....	
88,537	1,474	.4620	.....	
91,590	1,525	.4750	.....	
94,643	1,576	.5110	.....	Cracks in sight.
97,696	1,627	.5300	.....	
100,749	1,677	.5650	.....	Ultimate strength.

Opened longitudinal seams and crushed the bricks in four courses just above the middle of the height of the pier. The pier deflected downward.

No. 859.

8-inch brick pier.

Built of fifty courses of face brick.
Total weight, 539 pounds.
Weight per cubic foot, 126.8 pounds.
Total height, 120″.37.
Sectional area, 7″.82 × 7″.80 = 61.00 square inches.
Average thickness of joints, ″.22.
Gauged length, 100″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
0, 150	150	0.	0.	Initial load.
12, 200	200	.0039	.....	
15, 250	250	.0081	.....	
18, 300	300	.0128	.....	
21, 350	350	.0220	.....	
24, 400	400	.0360	.....	
27, 450	450	.0485	.....	
30, 500	500	.0691	.0420	
33, 550	550	.0862	.....	
36, 600	600	.1030	.....	
39, 650	650	.1240	.....	
42, 700	700	.1460	.1000	
45, 750	750	.1710	.....	
48, 800	800	.1865	.....	
51, 850	850	.2117	.....	
54, 900	900	.2300	.....	
57, 950	950	.2500	.....	
61, 000	1, 000	.2735	.....	
64, 050	1, 050	.2930	.....	
67, 100	1, 100	.3123	.....	
70, 150	1, 150	.3390	.....	
73, 200	1, 200	.3567	.....	
76, 250	1, 250	.3775	.....	
79, 300	1, 300	.3900	.....	
82, 350	1, 350	.4120	.....	
85, 400	1, 400	.4420	.....	
88. 450	1, 450	.4580	.....	
91, 500	1, 500	.4728	.....	Cracks in third course from bottom.
94, 550	1, 550	.4948	.....	
97, 600	1, 600	.5170	.....	
100, 650	1, 650	.5370	.....	
103, 700	1, 700	.5580	.....	
106, 750	1, 750	.5846	.....	
109, 800	1, 800	.6090	.....	
110, 500	1, 811	.....	.....	Ultimate strength.

Opened longitudinal seams and deflected upward at middle. Crushed four bricks near the middle of the pier.

No. 860.

12-inch brick pier.

Built of thirty courses of face brick, with core of common brick.
Total weight, 706 pounds.
Weight per cubic foot, 126.4 pounds.
Total height, 71″.68.
Sectional area, 11″.6×11″.6=134.56 square inches.
Average thickness of joints, ″.24.
Gauged length, 60″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
13,456	100	0.	0.	Initial load.
20,184	150	.0018	.....	
26,912	200	.0035	.....	
33,640	250	.0058	.....	
40,368	300	.0084	.....	
47,096	350	.0110	.....	
53,824	400	.0135	.....	
60,552	450	.0165	.....	
67,280	500	.0198	.0043	
74,008	550	.0230	.....	
80,736	600	.0268	.....	
87,464	650	.0298	.....	
94,192	700	.0340	.0090	
100,920	750	.0375	.....	
107,648	800	.0416	.....	
114,376	850	.0450	.....	
121,104	900	.0496	.....	
127,832	950	.0540	.....	
134,560	1,000	.0595	.0185	
141,288	1,050	.0664	.....	
148,016	1,100	.0710	.....	
154,744	1,150	.0765	.....	
161,472	1,200	.0821	.....	
168,200	1,250	.0865	.....	
174,928	1,300	.0940	.....	
181,656	1,350	.1005	.....	
188,384	1,400	.1070	.....	
195,112	1,450	.1137	.....	
201,840	1,500	.1200	.....	
208,568	1,550	.1300	.....	
215,296	1,600	.1380	.....	
222,024	1,650	.1440	.....	Cracks in sight.
228,752	1,700	.1520	.....	A brick in tenth course from bottom begins to crush.
235,480	1,750	.1635	.....	
242,208	1,800	.1695	.....	
248,936	1,850	.1810	.....	
255,664	1,900	.1950	.....	
257,300	1,912	.2100	.....	Ultimate strength.

No. 861

12-inch brick pier.

Built of thirty courses of face brick.
Total weight, 707 pounds.
Weight per cubic foot, 129 pounds.
Total height, 71″.27.
Sectional area, 11″.504 × 11″.55 = 132.82 square inches.
Average thickness of joints, ″.23.
Gauged length, 60″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
13,282	100	0.	0.	Initial load.
19,923	150	.0019	.....	
26,564	200	.0040	.....	
33,205	250	.0065	.....	
39,846	300	.0085	.....	
46,487	350	.0105	.....	
53,128	400	.0135	.....	
59,769	450	.0158	.....	
66,410	500	.0182	.0046	
73,051	550	.0217	.....	
79,692	600	.0245	.....	
86,333	650	.0275	.....	
92,974	700	.0310	.0080	
99,615	750	.0350	.....	
106,256	800	.0380	.....	
112,897	850	.0415	.....	
119,538	900	.0455	.....	
126,179	950	.0498	.....	
132,820	1,000	.0540	.0154	
139,461	1,050	.0605	.....	
146,102	1,100	.0647	.....	
152,743	1,150	.0696	.....	
159,384	1,200	.0745	.....	
166,025	1,250	.0785	.....	
172,666	1,300	.0850	.....	
179,307	1,350	.0910	.....	
185,948	1,400	.0972	.....	
192,589	1,450	.1030	.....	
199,230	1,500	.1090	.....	
205,871	1,550	.1175	.....	Crack in third course from bottom.
212,512	1,600	.1260	.....	
219,153	1,650	.1340	.....	
225,794	1,700	.1395	.....	
232,435	1,750	.1490	.....	A brick in the seventeenth course from bottom begins to crush.
239,076	1,800	.1580	.....	
245,717	1,850	.1670	.....	
252,358	1,900	.1775	.....	
258,100	1,943	.1940	.....	Ultimate strength.

Partially crushed bricks in five upper courses.

No. 862.

12-inch hollow brick pier.

Built of thirty courses of face brick.
Total weight, 619 pounds.
Weight per cubic foot, 130.3 pounds.

Cross-section dimensions..... 11″.50×11″.55=132.83 square inches.
Core ..... 4″.1×4″.2= 17.22

Sectional area of pier 115.61
Total height, 71″.
Average thickness of joints, ″.22.
Gauged length, 60″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
11,561	100	0.	0.	Initial load.
17,342	150	.0016	.....	
23,122	200	.0036	.....	
28,903	250	.0061	.....	
34,683	300	.0086	.....	
40,464	350	.0117	.....	
46,245	400	.0151	.....	
52,026	450	.0184	.....	Rested 5 minutes.
57,805	500	.0222	.0054	
63,586	550	.0264	.....	
69,366	600	.0304	.....	
75,147	650	.0350	.....	
80,927	700	.0394	.....	
86,708	750	.0438	.0144	
92,488	800	.0503	.....	
98,269	850	.0556	.....	
104,049	900	.0603	.....	
109,830	950	.0660	.....	
115,610	1,000	.0724	.0282	
121,391	1,050	.0803	.....	
127,171	1,100	.0858	.....	
132,952	1,150	.0910	.....	
138,732	1,200	.0982	.....	
144,513	1,250	.1044	.....	
150,293	1,300	.1112	.....	
156,074	1,350	.1193	.....	
161,854	1,400	.1270	.....	
167,635	1,450	.1350	.....	
173,415	1,500	.1422	.....	
179,196	1,550	.1503	.....	Cracks in sight.
184,976	1,600	.1602	.....	
190,757	1,650	.1693	.....	
196,537	1,700	.1776	.....	
202,318	1,750	.1880	.....	
208,098	1,800	.1975	.....	
213,879	1,850	.2145	.....	
219,659	1,900	.2410	.....	Ultimate strength.

Crushed bricks along middle courses.

No. 863.

16-inch brick pier.

Built of thirty courses of face brick.
Total weight, 1,250 pounds.
Weight per cubic foot, 129.5 pounds.
Total height, 70″.09.
Sectional area, 15″.40 × 15″.40 = 237.93 square inches.
Average thickness of joints, ″.24.
Gauged length, 60″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
23,793	100	0.	0.	Initial load.
35,690	150	.0015	.....	
47,586	200	.0032	.....	
59,483	250	.0054	.....	
71,379	300	.0077	.....	
83,276	350	.0101	.....	
95,172	400	.0122	.....	
107,069	450	.0154	.....	
118,965	500	.0182	.0032	
130,862	550	.0212	.....	
142,758	600	.0236	.....	
154,655	650	.0264	.....	
166,551	700	.0295	.0056	
178,448	750	.0329	.....	
190,344	800	.0359	.....	
202,241	850	.0393	.....	
214,137	900	.0428	.....	
226,034	950	.0466	.....	
237,930	1,000	.0499	.0111	
249,827	1,050	.0548	.....	
261,723	1,100	.0582	.....	
273,620	1,150	.0619	.....	
285,516	1,200	.0657	.....	
297,413	1,250	.0698	.....	
309,309	1,300	.0746	.....	
321,206	1,350	.0789	.....	
333,102	1,400	.0836	.....	
344,999	1,450	.0892	.....	
356,895	1,500	.0942	.....	
368,792	1,550	.0995	.....	
380,688	1,600	.1050	.....	
392,585	1,650	.1100	.....	Cracks in end courses.
404,481	1,700	.1188	.....	
416,378	1,750	.1242	.....	
428,274	1,800	.1300	.....	
440,171	1,850	.1378	.....	
452,067	1,900	.1465	.....	
463,964	1,950	.1575	.....	
475,860	2,000	.1665	.....	
487,757	2,050	.1795	.....	
499,653	2,100	.....	.....	Ultimate strength.

Partially crushed the bricks; the most injury being done the ends of the pier.

No. 864.

16-*inch brick pier.*

Built of thirty courses of face brick with common brick core.
Total weight, 1,243 pounds.
Weight per cubic foot, 126.1 pounds.
Total height, 71″.44.
Sectional area, 15″.35×15″.45=237.16 square inches.
Average thickness of joints, ″.22.
Gauged length, 60″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
23,716	100	0.	0.	Initial load.
35,574	150	.0018	.....	
47,432	200	.0040	.....	
59,290	250	.0068	.....	
71,148	300	.0093	.....	
83,006	350	.0120	.....	
94,864	400	.0149	.....	
106,722	450	.0175	.....	
118,580	500	.0212	.0050	
130,438	550	.0246	.....	
142,296	600	.0278	.....	
154,154	650	.0309	.....	
166,012	700	.0349	.0089	
177,870	750	.0390	.....	
189,728	800	.0420	.....	
201,586	850	.0457	.....	
213,444	900	.0495	.....	
225,302	950	.0528	.....	
237,160	1,000	.0570	.0159	
249,018	1,050	.0625	.....	
260,876	1,100	.0661	.....	
272,734	1,150	.0705	.....	
284,592	1,200	.0752	.....	
296,450	1,250	.0800	.....	
308,308	1,300	.0845	.....	
320,166	1,350	.0895	.....	
332,024	1,400	.0940	.....	
343,882	1,450	.0991	.....	End course at top of pier cracked.
355,740	1,500	.1074	.....	Crack in eighth course from top.
367,598	1,550	.1130	.....	
379,456	1,600	.1215	.....	
391,314	1,650	.1272	.....	
403,172	1,700	.1337	.....	
415,030	1,750	.1395	.....	
426,888	1,800	.1458	.....	
438,746	1,850	.1560	.....	
450,604	1,900	.1645	.....	
462,462	1,950	.1780	.....	
468,700	1,976	.1950	.....	Ultimate strength.

Partially crushed the bricks in the upper half of the pier.

No. 865.

8-inch brick pier.

Built of nine courses of common brick.
Total weight, 92 pounds.
Weight per cubic foot, 120.8 pounds.
Total height, 22″.87.
Sectional area, 7″.52×7″.65=57.53 square inches.
Average thickness of joints, ″.30.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
115,000	.....	.....	.....	Cracks.
161,000	2,798	.....	.....	Ultimate strength.

No. 866.

8-inch brick pier.

Built of nine courses of common brick.
Total weight, 96 pounds.
Weight per cubic foot, 123.3 pounds.
Total height, 23″.13.
Sectional area, 7″.60×7″.65=58.14 square inches.
Average thickness of joints, ″.26.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
68,000	.....	.....	.....	Cracks.
157,800	2,714	.....	.....	Ultimate strength.

Opened longitudinal seams and crushed the bricks.

No. 867.

8-inch brick pier.

Built of nineteen courses of common brick.
Total weight, 202 pounds.
Weight per cubic foot, 125.4 pounds.
Total height, 48″.37.
Sectional area, 7″.55 × 7″.60 = 57.38 square inches.
Average thickness of joints, ″.27.
Gauged length, 40″.
Pier cracked at middle in transportation.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
5,738	100	0.	0.	Initial load.
8,607	150	.0073	.....	
11,476	200	.0129	.....	
14,345	250	.0168	.....	
17,214	300	.0199	.....	
20,083	350	.0228	.....	
22,952	400	.0253	.....	
25,821	450	.0280	.....	
28,690	500	.0307	.0193	
31,559	550	.0338	.....	
34,428	600	.0365	.....	
37,297	650	.0392	.....	
40,166	700	.0426	.....	
43,035	750	.0450	.....	
45,904	800	.0490	.....	
48,773	850	.0525	.....	
51,642	900	.0563	.....	
54,511	950	.0603	.....	
57,380	1,000	.0646	.0360	
60,249	1,050	.0711	.....	
63,118	1,100	.0740	.....	
65,987	1,150	.0764	.....	
68,856	1,200	.0825	.....	
71,725	1,250	.0896	.....	
74,594	1,300	.0946	.....	
77,463	1,350	.0990	.....	
80,332	1,400	.1047	.....	Cracks in upper courses.
83,201	1,450	.1109	.....	
86,070	1,500	.1168	.....	
88,939	1,550	.1209	.....	
91,808	1,600	.1290	.....	
94,677	1,650	.1360	.....	
97,546	1,700	.1430	.....	
100,415	1,750	.1500	.....	
103,284	1,800	.1556	.....	
106,153	1,850	.1635	.....	
109,022	1,900	.1702	.....	
111,891	1,950	.2042	.....	Ultimate strength.

No. 868.

8-inch brick pier.

Built of nineteen courses of common brick.
Total weight, 200 pounds.
Weight per cubic foot, 124.6 pounds.
Total height, 47″.62.
Sectional area, 7″.68 × 7″.58 = 58.21 square inches.
Average thickness of joints, ″.25.
Gauged length, 40″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
5,821	100	0.	0.	Initial load.
8,731	150	.0012	.....	
11,642	200	.0028	.....	
14,552	250	.0044	.....	
17,463	300	.0061	.....	
20,373	350	.0077	.....	
23,284	400	.0098	.....	
26,194	450	.0119	.....	
29,105	500	.0143	.0027	
32,015	550	.0170	.....	
34,926	600	.0190	.....	
37,836	650	.0215	.....	
40,747	700	.0246	.....	
43,657	750	.0278	.....	
46,568	800	.0312	.....	
49,478	850	.0351	.....	
52,389	900	.0391	.....	
55,299	950	.0423	.....	
58,210	1,000	.0476	.0179	
61,120	1,050	.0546	.....	
64,031	1,100	.0582	.....	
66,941	1,150	.0623	.....	
69,852	1,200	.0679	.....	
72,762	1,250	.0724	.....	
75,673	1,300	.0798	.....	
78,583	1,350	.0860	.....	
81,494	1,400	.0920	.....	
84,404	1,450	.0980	.....	
87,315	1,500	.1100	.....	
90,225	1,550	.1186	.....	Cracks.
93,136	1,600	.1250	.....	
96,046	1,650	.1350	.....	
98,957	1,700	.1528	.....	
101,867	1,750	.1695	.....	Ultimate strength.

No. 869.

8-inch brick pier.

Built of twenty-nine courses of common brick.
Total weight, 301 pounds.
Weight per cubic foot, 121.5 pounds.
Total height, 73″.62.
Sectional area, 7″.65 × 7″.60 = 58.14 square inches.
Average thickness of joints, ″.26.
Gauged length, 60″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,721	150	0.	0.	Initial load.
11,628	200	.0016	.....	
14,535	250	.0033	.....	
17,442	300	.0055	.....	
20,349	350	.0075	.....	
23,256	400	.0097	.....	
26,163	450	.0132	.....	
29,070	500	.0147	.0032	
31,977	550	.0174	.....	
34,884	600	.0198	.....	
37,791	650	.0222	.....	
40,698	700	.0251	.0060	
43,605	750	.0285	.....	
46,512	800	.0310	.....	
49,419	850	.0341	.....	
52,326	900	.0370	.....	
55,233	950	.0396	.....	
58,140	1,000	.0435	.0118	
61,017	1,050	.0475	.....	
63,954	1,100	.0504	.....	
66,861	1,150	.0540	.....	
69,768	1,200	.0592	.....	
72,675	1,250	.0630	.....	
75,582	1,300	.0665	.....	
78,489	1,350	.0710	.....	
81,396	1,400	.0735	.....	
84,303	1,450	.0785	.....	
87,210	1,500	.0838	.....	
90,117	1,550	.0875	.....	
93,024	1,600	.0930	.....	
95,931	1,650	.0998	.....	
98,838	1,700	.1040	.....	
101,745	1,750	.1095	.....	Cracks in middle courses.
104,652	1,800	.1130	.....	
107,559	1,850	.1210	.....	
110,466	1,900	.1270	.....	
113,373	1,950	.1325	.....	
116,280	2,000	.1380	.....	
119,187	2,050	.1511	.....	
122,094	2,100	.1575	.....	
125,001	2,150	.1665	.....	
127,908	2,200	.1730	.....	
130,815	2,250	.1790	.....	
133,722	2,300	.1885	.....	
136,629	2,350	.2005	.....	
139,536	2,400	.2125	.....	
142,443	2,450	.2275	.....	
144,300	2,481	.2410	.....	Ultimate strength.

No. 870.

8-inch brick pier.

Built of twenty-nine courses of common brick.
Total weight, 301 pounds.
Weight per cubic foot, 123.3 pounds.
Total height, 73″.18.
Sectional area, 7″.60×7.″58=57.61 square inches.
Average thickness of joints, ″.28.
Gauged length, 60″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,642	150	0.	0.	Initial load.
11,522	200	.0015	.....	
14,403	250	.0030	.....	
17,283	300	.0051	.....	
20,164	350	.0078	.....	
23,044	400	.0105	.....	
25,925	450	.0135	.....	
28,805	500	.0168	.0032	
31,686	550	.0200	.....	
34,566	600	.0230	.....	
37,447	650	.0258	.....	
40,327	700	.0290	.0075	
43,208	750	.0330	.....	
46,088	800	.0370	.....	
48,969	850	.0395	.....	
51,849	900	.0430	.....	
54,730	950	.0480	.....	
57,610	1,000	.0520	.0165	
60,491	1,050	.0570	.....	
63,371	1,100	.0600	.....	
66,252	1,150	.0640	.....	
69,132	1,200	.0710	.....	
72,013	1,250	.0750	.....	
74,893	1,300	.0805	.....	
77,774	1,350	.0860	.....	
80,654	1,400	.0895	.....	
83,535	1,450	.0960	.....	Cracks.
86,415	1,500	.1050	.....	
89,296	1,550	.1100	.....	
92,176	1,600	.1145	.....	
95,057	1,650	.1240	.....	
97,937	1,700	.1340	.....	
100,818	1,750	.1430	.....	
103,698	1,800	.1520	.....	
106,579	1,850	.1610	.....	
109,459	1,900	.1705	.....	
112,340	1,950	.1780	.....	
115,220	2,000	.1853	.....	
118,101	2,050	.1950	.....	
120,981	2,100	.2090	.....	
123,862	2,150	.2210	.....	
126,742	2,200	.2310	.....	
129,623	2,250	.2420	.....	
132,503	2,300	.2650	.....	Ultimate strength.

Principal fractures confined to the upper courses of bricks. Partially crushed the bricks in the seventh course.

No. 871.

8-inch brick pier.

Built of thirty-nine courses of common brick.
Total weight, 400 pounds.
Weight per cubic foot, 121.4 pounds.
Total height, 97″.50.
Sectional area, 7″.65 × 7″.63 = 58.37 square inches.
Average thickness of joints, ″.30.
Gauged length, 80″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,756	150	0.	0.	Initial load.
11,674	200	.0031	.....	
14,593	250	.0070	.....	
17,511	300	.0130	.....	
20,430	350	.0220	.....	
23,348	400	.0320	.....	
26,267	450	.0445	.....	
29,185	500	.0560	.0370	
32,104	550	.0725	.....	
35,022	600	.0860	.....	
37,941	650	.1020	.....	
40,859	700	.1180	.0825	
43,777	750	.1390	.....	
46,696	800	.1525	.....	
49,615	850	.1700	.....	
52,533	900	.1880	.....	
55,452	950	.2090	.....	
58,370	1,000	.2290	.1685	
61,289	1,050	.2540	.....	
64,207	1,100	.2670	.....	
67,126	1,150	.2940	.....	
70,044	1,200	.3090	.....	
72,963	1,250	.3280	.....	Cracks in sight.
75,881	1,300	.3500	.....	
78,800	1,350	.3690	.....	
81,718	1,400	.3925	.....	
84,636	1,450	.4110	.....	
87,555	1,500	.4360	.....	
90,474	1,550	.....	.....	Ultimate strength.

Principal failure in thirteenth, fourteenth, and fifteenth courses from the bottom, where the bricks partially crushed. Opened longitudinal seams.

No. 872.

8-inch brick pier.

Built of thirty-eight courses of common brick.
Total weight, 387 pounds.
Weight per cubic foot, 121.4 pounds.
Total height, 95″.98.
Sectional area, 7″.60 × 7″.55 = 57.38 square inches.
Average thickness of joints, ″.30.
Gauged length, 80″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,607	150	0.	0.	Initial load.
11,476	200	.0030	.....	
14,345	250	.0090	.....	
17,214	300	.0185	.....	
20,083	350	.0284	.....	
22,952	400	.0410	.....	
25,821	450	.0570	.....	
28,690	500	.0725	.0493	
31,559	550	.0880	.....	
34,428	600	.1070	.....	
37,297	650	.1240	.....	
40,160	700	.1485	.1115	
43,035	750	.1700	.....	
45,904	800	.1860	.....	
48,773	850	.2050	.....	
51,642	900	.2300	.....	
54,511	950	.2518	.....	
57,380	1,000	.2825	.2210	
60,249	1,050	.3040	.....	
63,118	1,100	.3235	.....	
65,987	1,150	.3390	.....	
68,856	1,200	.3660	.....	
71,725	1,250	.3910	.....	Cracks in sight.
74,594	1,300	.4160	.....	
77,463	1,350	.4440	.....	
80,332	1,400	.4845	.....	
83,201	1,450	.5080	.....	
86,070	1,500	.5420	.....	
90,800	1,582	.....	.....	Ultimate strength.

No. 873.

8-inch brick pier.

Built of forty-eight courses of common brick.
Total weight, 486 pounds.
Weight per cubic foot, 121 pounds.
Total height, 120″.93.
Sectional area, 7″.55×7″.60=57.38 square inches.
Average thickness of joints, ″.30.
Gauged length, 100″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,607	150	0.	0.	Initial load.
11,476	200	.0021	.....	
14,345	250	.0061	.....	
17,214	300	.0110	.....	
20,083	350	.0198	.....	
22,952	400	.0350	.....	
25,821	450	.0520	.....	
28,690	500	.0786	.0515	
31,559	550	.0959	.....	
34,428	600	.1140	.....	
37,297	650	.1390	.....	
40,166	700	.1600	.1160	
43,035	750	.1860	.....	
45,904	800	.2100	.....	
48,773	850	.2337	.....	
51,642	900	.2645	.....	Cracks in upper courses.
54,511	950	.2920	.....	
57,380	1,000	.3150	.....	
60,249	1,050	.3390	.....	
63,118	1,100	.3770	.....	
65,987	1,150	.4020	.....	
68,856	1,200	.4370	.....	
71,725	1,250	.4650	.....	
74,594	1,300	.4870	.....	
77,463	1,350	.5220	.....	
80,332	1,400	.5500	.....	
83,201	1,450	.5970	.....	
86,070	1,500	.....	.....	Ultimate strength.

Principal fractures confined to the upper thirteen courses.

No. 874.

8-inch brick pier.

Built of forty-nine courses of common brick.
Total weight, 496 pounds.
Weight per cubic foot, 123.1 pounds.
Total height, 121″.31.
Sectional area, 7″.55×7″.60=57.38 square inches.
Average thickness of joints, ″.28.
Gauged length, 100″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
8,607	150	0.	0.	Initial load.
11,476	200	.0035	.....	
14,345	250	.0075	.....	
17,214	300	.0140	.....	
20,083	350	.0260	.....	
22,952	400	.0380	.....	
25,821	450	.0500	.....	
28,690	500	.0685	.0425	
31,559	550	.0840	.....	
34,428	600	.1020	.....	
37,297	650	.1210	.....	
40,166	700	.1430	.1000	
43,035	750	.1645	.....	
45,904	800	.1850	.....	
48,773	850	.2050	.....	
51,642	900	.2300	.....	
54,511	950	.2500	.....	
57,380	1,000	.2780	.2082	
60,249	1,050	.3035	.....	
63,118	1,100	.3215	.....	
65,987	1,150	.3470	.....	
68,856	1,200	.3660	.....	
71,725	1,250	.3800	.....	Cracks in upper courses.
74,594	1,300	.4100	.....	
77,463	1,350	.4360	.....	
80,332	1,400	.4600	.....	
83,201	1,450	.4870	.....	
86,070	1,500	.5090	.....	
88,939	1,550	.5370	.....	
91,808	1,600	.5740	.....	
94,677	1,650	.5930	.....	
97,546	1,700	.6160	.....	
100,415	1,750	.6770	.....	
103,284	1,800	.7250	.....	
104,200	1,815	.....	.....	Ultimate strength.

Opened longitudinal seams and partially crushed the bricks in the upper half of the pier.

No. 875.

12-inch brick pier.

Built of nine courses of common brick.
Total weight, 218 pounds.
Weight per cubic foot, 123.5 pounds.
Total height, 23″.06.
Sectional area, 11″.60 × 11″.40 = 132.24 square inches.
Average thickness of joints, ″.25.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
175,000	.....	.....	.....	Cracks.
307,890	2,329	.....	.....	Ultimate strength.

No. 876.

12-inch brick pier.

Built of nine courses of common brick.
Total weight, 214 pounds.
Weight per cubic foot, 125.8 pounds.
Total height, 22″.75.
Sectional area, 11″.35×11″.38=129.16 square inches.
Average thickness of joints, ″.25.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
210,000	.....	.....	.....	Cracks.
318,500	2,466	.....	.....	Ultimate strength.

No. 877.

12-inch brick pier.

Built of nineteen courses of common brick.
Total weight, 457 pounds.
Weight per cubic foot, 124.9 pounds.
Total height, 47″.58.
Sectional area, 11″.50×11″.55=132.83 square inches.
Average thickness of joints, ″.25.
Gauged length, 40″.
End plates not used.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
13,283	100	0.	0.	Initial load.
19,925	150	.0010	.....	
26,566	200	.0038	.....	
33,208	250	.0048	.0008	
39,849	300	.0060	.....	
46,491	350	.0085	.....	
53,132	400	.0104	.....	
59,774	450	.0125	.....	
66,415	500	.0155	.0040	
73,057	550	.0175	.....	
79,698	600	.0205	.....	
86,340	650	.0220	.....	
92,891	700	.0260	.0075	
99,623	750	.0280	.....	
106,264	800	.0305	.....	
112,906	850	.0335	.....	
119,547	900	.0380	.....	
126,189	950	.0408	.....	
132,830	1,000	.0445	.0165	
139,472	1,050	.0490	.....	
146,113	1,100	.0515	.....	
152,755	1,150	.0545	.....	Cracks in sight.
159,396	1,200	.0580	.....	
166,038	1,250	.0640	.....	
172,679	1,300	.0670	.....	
179,321	1,350	.0715	.....	
185,962	1,400	.0760	.....	
192,603	1,450	.0817	.....	
199,245	1,500	.0875	.....	
205,886	1,550	.0950	.....	
212,528	1,600	.1090	.....	
219,170	1,650	.1260	.....	
224,100	1,687	.1340	.....	Ultimate strength.

No. 878.

12-inch brick pier.

Built of nineteen courses of common brick.
Total weight, 446 pounds.
Weight per cubic foot, 125.1 pounds.
Total height, 47″.81.
Sectional area, 11″.30×11″.40=128.82 square inches.
Average thickness of joints, ″.28.
Gauged length, 40″.
End plates not used.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
12,882	100	0.	0.	Initial load.
19,323	150	.0018	.....	
25,764	200	.0037	.....	
32,205	250	.0054	.....	
38,646	300	.0072	.....	
45,807	350	.0092	.....	
51,528	400	.0111	.....	
57,969	450	.0132	.....	
64,410	500	.0154	.0042	
70,851	550	.0176	.....	
77,292	600	.0197	.....	
83,733	650	.0218	.....	
90,174	700	.0240	.....	
96,615	750	.0266	.....	
103,056	800	.0290	.....	
109,497	850	.0319	.....	
115,938	900	.0340	.....	
122,379	950	.0367	.....	
128,820	1,000	.0390	.0117	
135,261	1,050	.0435	.....	
141,702	1,100	.0456	.....	
148,143	1,150	.0478	.....	
154,584	1,200	.0508	.....	
161,025	1,250	.0541	.....	
167,466	1,300	.0574	.....	
173,907	1,350	.0607	.....	
180,348	1,400	.0636	.....	
186,789	1,450	.0668	.....	
193,230	1,500	.0710	.....	
199,671	1,550	.0755	.....	
206,112	1,600	.0790	.....	
212,553	1,650	.0842	.....	
218,994	1,700	.0880	.....	Cracks in sight.
225,435	1,750	.0936	.....	
231,876	1,800	.0980	.....	
238,317	1,850	.1050	.....	
244,758	1,900	.1160	.....	
251,199	1,950	.1265	.....	Ultimate strength.

No. 879.

12-inch brick pier.

Built of twenty-nine courses of common brick.
Total weight, 680 pounds.
Weight per cubic foot, 123.2 pounds.
Total height, 72″.75.
Sectional area, 11″.45×11″.45=131.10 square inches.
Average thickness of joints, ″.25.
Gauged length, 60″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
13,110	100	0.	0.	Initial load.
19,665	150	.0000	.....	
26,220	200	.0019	.....	
32,775	250	.0045	.....	
39,330	300	.0075	.....	
45,885	350	.0105	.....	
52,440	400	.0140	.....	
58,995	450	.0182	.....	
65,550	500	.0221	.0060	
72,105	550	.0270	.....	
78,660	600	.0325	.....	
85,215	650	.0388	.....	
91,770	700	.0435	.0170	
98,325	750	.0490	.....	
104,880	800	.0545	.....	
111,435	850	.0605	.....	
117,990	900	.0690	.....	
124,545	950	.0770	.....	
131,100	1,000	.0835	.0410	
137,655	1,050	.0958	.....	
144,210	1,100	.1045	.....	Cracks in sight.
150,765	1,150	.1135	.....	
157,320	1,200	.1195	.....	
163,875	1,250	.1320	.....	
170,430	1,300	.1435	.....	
176,985	1,350	.1555	.....	
183,540	1,400	.1690	.....	
190,095	1,450	.1800	.....	
196,650	1,500	.1920	.....	
203,205	1,550	.2070	.....	
209,760	1,600	.2180	.....	
216,315	1,650	.2310	.....	
222,870	1,700	.2530	.....	Ultimate strength.

No. 880.

12-inch brick pier.

Built of twenty-nine courses of common brick.
Total weight, 674 pounds.
Weight per cubic foot, 121.7 pounds.
Total height, 72″.75.
Sectional area, 11″.45×11″.48=131.45 square inches.
Gauged length, 60″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
13,145	100	0.	0.	Initial load.
19,718	150	.0017	.....	
26,290	200	.0042	.....	
32,863	250	.0067	.....	
39,435	300	.0100	.....	
46,008	350	.0130	.....	
52,580	400	.0175	.....	
59,153	450	.0210	.....	
65,725	500	.0250	.0085	
72,298	550	.0310	.....	
78,870	600	.0350	.....	
85,443	650	.0400	.....	
92,015	700	.0460	.0290	
98,588	750	.0540	.....	
105,160	800	.0580	.....	
111,733	850	.0665	.....	
118,305	900	.0720	.....	
124,878	950	.0785	.....	
131,450	1,000	.0880	.0440	
138,023	1,050	.0990	.....	
144,595	1,100	.1075	.....	Rested 3 minutes.
151,168	1,150	.1157	.....	
157,740	1,200	.1225	.....	
164,313	1,250	.1300	.....	
170,885	1,300	.1390	.....	
177,458	1,350	.1530	.....	Cracks in sight.
184,030	1,400	.1630	.....	
190,603	1,450	.1730	.....	
197,175	1,500	.1900	.....	
203,748	1,550	.2095	.....	
210,320	1,600	.2280	.....	
216,200	1,644	.2645	.....	Ultimate strength.

No. 881.

12-inch brick pier.

Built of thirty-eight courses of common brick.
Total weight, 895 pounds.
Weight per cubic foot, 121.6 pounds.
Total height, 97″.37.
Sectional area, 11″.40 × 11″.45=130.53 square inches.
Average thickness of joints, ″.27.
Gauged length, 80″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
19,580	150	0.	0.	Initial load.
26,106	200	.0029	.....	
32,633	250	.0072	.....	
39,159	300	.0140	.....	
45,686	350	.0186	.....	
52,212	400	.0267	.....	
58,739	450	.0340	.....	
65,265	500	.0445	.0238	
71,792	550	.0540	.....	
78,318	600	.0630	.....	
84,845	650	.0750	.....	
91,371	700	.0895	.0555	
97,898	750	.1050	.....	
104,424	800	.1160	.....	
110,950	850	.1330	.....	
117,477	900	.1495	.....	
124,004	950	.1695	.....	
130,530	1,000	.1830	.1270	
137,057	1,050	.2050	.....	Cracks in upper half of pier.
143,583	1,100	.2240	.....	
150,110	1,150	.2420	.....	
156,636	1,200	.2620	.....	
163,163	1,250	.2820	.....	
169,690	1,300	.3110	.....	
176,216	1,350	.3400	.....	
182,742	1,400	.3700	.....	
185,400	1,420	.3860	.....	
190,700	1,461	.....	.....	Ultimate strength.

Opened longitudinal seams.

No. 882.

12-inch brick pier.

Built of thirty-eight courses of common brick.
Total weight, 887 pounds.
Weight per cubic foot, 120.8 pounds.
Total height, 96″.75.
Sectional area, 1″.40 × 11″.50 = 131.10 square inches.
Average thickness of joints, ″.28.
Gauged length, 80″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
19,665	150	0.	.0	Initial load.
26,220	200	.0021	.....	
32,775	250	.0050	.....	
39,330	300	.0085	.....	
45,885	350	.0140	.....	
52,440	400	.0185	.....	
58,995	450	.0250	.....	
65,550	500	.0340	.0140	
72,105	550	.0408	.....	
78,660	600	.0490	.....	
85,215	650	.0570	.....	
91,770	700	.0695	.0362	
98,325	750	.0820	.....	
104,880	800	.0910	.....	
111,435	850	.1000	.....	
117,990	900	.1165	.....	
124,545	950	.1280	.....	
131,100	1,000	.1420	.0872	
137,655	1,050	.1635	.....	
144,210	1,100	.1760	.....	Cracks in sight.
150,765	1,150	.1930	.....	
157,320	1,200	.2060	.....	
163,875	1,250	.2240	.....	
170,430	1,300	.2468	.....	
176,985	1,350	.2630	.....	
183,540	1,400	.2900	.....	
190,095	1,450	.3030	.....	
196,650	1,500	.3300	.....	
203,205	1,550	.3525	.....	
209,760	1,600	.3970	.....	
211,100	1,610	.....	.....	Ultimate strength.

No. 883.

12-inch brick pier.

Built of forty-eight courses of common brick.
Total weight, 1,130 pounds.
Weight per cubic foot, 121.9 pounds.
Total height, 121″.0.
Sectional area, 11″.45×11″.55=132.25 square inches.
Average thickness of joints, ″.28.
Gauged length, 100″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
19,838	150	0.	0.	Initial load.
26,450	200	.0033	.....	
33,063	250	.0064	.....	
39,675	300	.0096	.....	
46,288	350	.0169	.....	
52,900	400	.0214	.....	
59,513	450	.0276	.....	
66,125	500	.0428	.0186	
72,738	550	.0521	.....	
79,350	600	.0607	.....	
85,963	650	.0731	.....	
92,575	700	.0850	.0442	
99,188	750	.0985	.....	
105,800	800	.1150	.....	
112,413	850	.1265	.....	
119,025	900	.1430	.....	
125,638	950	.1610	.....	
132,250	1,000	.1805	.1133	
138,863	1,050	.2065	.....	
145,475	1,100	.2300	.....	Cracks opened.
152,088	1,150	.2537	.....	
158,700	1,200	.2879	.....	
165,313	1,250	.3100	.....	
171,925	1,300	.3690	.....	
178,200	1,347	.....	.....	Ultimate strength.

Principal injury done the middle and upper half of the pier.

No. 884.

12-inch hollow brick pier.

Built of nine courses of common brick.
Total weight, 184 pounds.
Weight per cubic foot, 126.2 pounds.
Total height, 23″.
Cross-section dimensions.....11″.4 × 11″.4 = 129.96 square inches.
Core..... 4″.5 × 4″.5 = 20.48 Do.

Sectional area..... 109.48 Do.
Average thickness of joints, ″.30.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
182,000	.....	.....	.....	Cracks.
271,500	2,480	.....	.....	Ultimate strength.

No. 885.

12-inch hollow brick pier.

Built of nine courses of common brick.
Total weight, 201 pounds.
Weight per cubic foot, 127.7 pounds.
Total height, 25″.12.
Cross-section dimension.....11″.40×11″.45 = 130.53 square inches.
Core..... 4″.55× 4″.9 = 22.30

Sectional area..... 108.23
Average thickness of joints, ″.30.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
138,000	.....	.....	.....	Cracks.
265,400	2,452	.....	.....	Ultimate strength.

No. 886.

12-inch hollow brick pier.

Built of nineteen courses of common brick.
Total weight, 379 pounds.
Weight per cubic foot, 127.3 pounds.
Total length, 48″.18.

Cross-section dimensions.....11″.35×11″.35=128.82 square inches.
Core ..... 4″.70× 4″.70= 22.09 Do.

Sectional area ..... 106.73 Do.

Average thickness of joints, ″.26.
Gauged length, 40″.
End plates not used.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,673	100	0.	0.	Initial load.
16,010	150	.0015	.....	
21,346	200	.0040	.....	
26,683	250	.0060	.....	
32,019	300	.0090	.....	
37,356	350	.0125	.....	
42,692	400	.0160	.....	
48,029	450	.0200	.....	
53,365	500	.0260	.0130	
58,702	550	.0309	.....	
64,038	600	.0360	.....	
69,375	650	.0415	.....	
74,711	700	.0480	.0280	
80,048	750	.0565	.....	
85,384	800	.0620	.....	
90,721	850	.0695	.....	
96,057	900	.0785	.....	
101,394	950	.0855	.....	
106,730	1,000	.0950	.0640	Cracks in sight.
112,067	1,050	.1100	.....	
117,403	1,100	.1165	.....	
122,740	1,150	.1240	.....	
128,076	1,200	.1365	.....	
133,413	1,250	.1445	.....	
138,749	1,300	.1530	.....	
144,086	1,350	.1645	.....	
149,422	1,400	.1750	.....	
154,759	1,450	.1860	.....	
160,095	1,500	.2000	.....	
165,432	1,550	.2110	.....	
170,768	1,600	.2250	.....	
176,105	1,650	.2410	.....	
181,441	1,700	.2530	.....	
186,778	1,750	.2640	.....	
192,114	1,800	.2790	.....	
197,451	1,850	.3000	.....	
198,100	1,856	.....	.....	Ultimate strength.

No. 887.

12-inch hollow brick pier.

Built of nineteen courses of common brick.
Total weight, 383 pounds.
Weight per cubic foot, 127.7 pounds.
Total height, 47″.98.
Cross-section dimensions.....11″.40×11″.45=130.53 square inches.
Core ..... 4″.70× 4″.80= 22.56 Do.

Sectional area..... 107.97 Do.
Average thickness of joints, ″.26.
Gauged length, 40″.
End plates not used.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,797	100	0.	0.	Initial load.
16,196	150	.0020	.....	
21,594	200	.0044	.....	
26,993	250	.0071	.....	
32,391	300	.0100	.....	
37,790	350	.0138	.....	
43,188	400	.0168	.....	
48,587	450	.0206	.....	
53,985	500	.0253	.0124	
59,384	550	.0304	.....	
64,782	600	.0346	.....	
70,181	650	.0396	.....	
75,579	700	.0458	.....	
80,978	750	.0527	.....	
86,376	800	.0551	.....	
91,775	850	.0643	.....	
97,173	900	.0730	.....	
102,572	950	.0792	.....	
107,970	1,000	.0865	.....	Cracks in sight.
113,369	1,050	.0933	.....	
118,767	1,100	.0991	.....	
124,166	1,150	.1100	.....	
129,564	1,200	.1185	.....	
134,963	1,250	.1251	.....	
140,361	1,300	.1330	.....	
145,760	1,350	.1425	.....	
151,158	1,400	.1540	.....	
156,557	1,450	.1610	.....	
161,955	1,500	.1690	.....	
167,354	1,550	.1785	.....	
172,752	1,600	.1910	.....	
178,151	1,650	.2020	.....	
183,549	1,700	.2150	.....	
188,948	1,750	.2240	.....	
194,346	1,800	.2362	.....	
199,745	1,850	.2490	.....	
205,143	1,900	.2657	.....	
210,542	1,950	.2915	.....	
215,200	1,993	.3040	.....	Ultimate strength.

No. 888.

12-inch hollow brick pier.

Built of twenty-nine courses of common brick.
Total weight, 557 pounds.
Weight per cubic foot, 121.4 pounds.
Total height, 72″.75.
Cross-section dimensions ..11″.35 × 11″.35 = 128.82 square inches.
Core ..... 4″.9 × 4″.6 = 22.54 Do.

Sectional area ..... 106.28 Do.
Average thickness of joints, ″.28.
Gauged length, 60″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,628	100	0.	0.	Initial load.
15,942	150	.0018	.....	
21,256	200	.0041	.....	
26,570	250	.0070	.....	
31,884	300	.0108	.....	
37,198	350	.0151	.....	
42,512	400	.0210	.....	
47,826	450	.0265	.....	
53,140	500	.0330	.0140	
58,454	550	.0105	.....	
63,768	600	.0475	.....	
69,082	650	.0560	.....	
74,396	700	.0645	.0340	
79,710	750	.0760	.....	
85,024	800	.0835	.....	
90,338	850	.0925	.....	
95,652	900	.1050	.....	
100,966	950	.1165	.....	
106,280	1,000	.1295	.0815	
111,594	1,050	.1465	.....	
116,908	1,100	.1570	.....	Cracks in sight.
122,222	1,150	.1680	.....	
127,536	1,200	.1790	.....	
132,850	1,250	.1990	.....	
138,164	1,300	.2090	.....	
143,478	1,350	.2290	.....	
148,792	1,400	.2490	.....	
154,106	1,450	.2680	.....	
162,100	1,525	.....	.....	Ultimate strength.

No. 889.

12-inch hollow brick pier.

Built of thirty-nine courses of common brick.
Total weight, 776 pounds.
Weight per cubic foot, 124.3 pounds.
Total height, 99″.18.
Cross-section dimensions .....11″.5×11″.5=132.25 square inches.
Core ..... 4″.8× 4″.9= 23.52 Do.

Sectional area ..... 108.73 Do.
Average thickness of joints, ″.27.
Gauged length, 80″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
16,310	150	0.	0.	Initial load.
21,746	200	.0028	.....	
27,183	250	.0072	.....	
32,619	300	.0130	.....	
38,056	350	.0195	.....	
43,492	400	.0270	.....	
48,929	450	.0350	.....	
54,365	500	.0440	.0248	
59,802	550	.0550	.....	
65,238	600	.0650	.....	
70,675	650	.0752	.....	
76,111	700	.0904	.0584	
81,547	750	.1020	.....	
86,984	800	.1130	.....	
92,421	850	.1250	.....	
97,857	900	.1410	.....	
103,294	950	.1560	.....	
108,730	1,000	.1710	.1190	
114,167	1,050	.1930	.....	Cracks in sight.
119,603	1,100	.2030	.....	
125,040	1,150	.2220	.....	
130,476	1,200	.2360	.....	
135,913	1,250	.2560	.....	
141,349	1,300	.2760	.....	
146,786	1,350	.2930	.....	
152,222	1,400	.3160	.....	
157,659	1,450	.3330	.....	
163,095	1,500	.3530	.....	
168,532	1,550	.3760	.....	
173,968	1,600	.4010	.....	
179,405	1,650	.4230	.....	
184,841	1,700	.4460	.....	Ultimate strength.

Opened longitudinal seams.

No. 890.

12-inch, hollow, brick pier.

Built of forty-eight courses of common brick.
Total weight, 957 pounds.
Weight per cubic foot, 125.1 pounds.
Total height, 122″.27.
Cross-section dimensions ..... 11″.40×11″.50=131.10 square inches.
Core ..... 4″.80× 4″.80= 23.04 Do.

Sectional area ..... 108.06 Do.
Average thickness of joints, ″.26.
Gauged length, 100″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
10,209	150	0.	0.	Initial load.
21,612	200	.0031	.....	
27,015	250	.0067	.....	
32,418	300	.0102	.....	
37,821	350	.0168	.....	
43,224	400	.0266	.....	
48,627	450	.0368	.....	
54,030	500	.0464	.0226	
59,433	550	.0621	.....	
64,836	600	.0745	.....	
70,239	650	.0880	.....	
75,642	700	.1052	.....	
81,045	750	.1215	.....	
86,448	800	.1443	.....	
91,851	850	.1620	.....	
97,254	900	.1828	.....	
102,657	950	.2100	.....	Cracks in the courses near the middle of the height of the pier.
108,060	1,000	.2260	.....	
113,463	1,050	.2399	.....	
118,866	1,100	.2708	.....	
124,269	1,150	.2920	.....	
129,672	1,200	.3140	.....	
135,075	1,250	.3320	.....	
140,478	1,300	.3670	.....	
145,881	1,350	.3960	.....	
151,284	1,400	.4260	.....	
156,687	1,450	.4620	.....	
157,500	1,457	.....	.....	Ultimate strength.

No. 891.

16-inch brick pier.

Built of twenty-nine courses of common brick.
Total weight, 1,248 pounds.
Weight per cubic foot, 123 pounds.
Total height, 73″.18.
Sectional area, 15″.45×15″.50=239.48 square inches.
Average thickness of joints, ″.26.
Gauged length, 60″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
23,948	100	0.	0.	Initial load.
35,922	150	.0023	.....	
47,896	200	.0052	.....	
59,870	250	.0082	.....	
71,844	300	.0112	.....	
83,818	350	.0150	.....	
95,792	400	.0190	.....	
107,766	450	.0233	.....	
119,740	500	.0279	.0101	
131,714	550	.0336	.....	
143,688	600	.0382	.....	
155,662	650	.0440	.....	
167,636	700	.0498	.0285	
179,610	750	.0564	.....	
191,584	800	.0021	.....	
203,558	850	.0700	.....	
215,532	900	.0770	.....	
227,506	950	.0837	.....	
239,480	1,000	.0938	.0463	
251,454	1,050	.1048	.....	
263,428	1,100	.1106	.....	
275,402	1,150	.1201	.....	Cracks.
287,376	1,200	.1317	.....	
299,350	1,250	.1394	.....	
311,324	1,300	.1508	.....	
323,298	1,350	.1670	.....	
335,272	1,400	.1770	.....	
347,246	1,450	.1897	.....	
358,220	1,495	.2300	.....	Ultimate strength.

No. 892.

16-*inch brick pier.*

Built of twenty-eight courses of common brick.
Total weight, 1,271 pounds.
Weight per cubic foot, 121.8 pounds.
Total height, 73″.37.
Sectional area, 15″.65 × 15″.70 = 245.71 square inches.
Average thickness of joints, ″.26.
Gauged length, 60″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
24,571	100	0.	0.	Initial load.
36,857	150	.0023	.....	
49,142	200	.0059	.....	
61,428	250	.0090	.....	
73,713	300	.0128	.....	
85,999	350	.0173	.....	
98,284	400	.0232	.....	
110,570	450	.0287	.....	
122,855	500	.0362	.0180	
135,141	550	.0450	.....	Rested 3 minutes.
147,426	600	.0551	.....	
159,712	650	.0665	.....	
171,997	700	.0682	.0390	
184,283	750	.0810	.....	
196,568	800	.0910	.....	
208,854	850	.1008	.....	
221,139	900	.1128	.....	Cracks.
233,425	950	.1255	.....	
245,710	1,000	.1395	.0896	
257,996	1,050	.1580	.....	
270,281	1,100	.1670	.....	
282,567	1,150	.1800	.....	
294,852	1,200	.1955	.....	
307,138	1,250	.2135	.....	
319,423	1,300	.2345	.....	
331,709	1,350	.2510	.....	
343,994	1,400	.2700	.....	
356,280	1,450	.2985	.....	
358,600	1,451	.....	.....	Ultimate strength.

No. 893.

16-*inch brick pier.*

Built of forty-seven courses of common brick.
Total weight, 2,035 pounds.
Weight per cubic foot, 123.7 pounds.
Total height, 119″.
Sectional area, 15″.40×15″.50=238.70 square inches.
Average thickness of joints, ″.26.
Gauged length, 100″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
23,870	100	0.	0.	Initial load.
35,805	150	.0039	.....	
47,740	200	.0083	.....	
59,675	250	.0133	.....	
71,610	300	.0328	.....	
83,545	350	.0527	.....	
95,480	400	.0704	.....	
107,415	450	.1003	.....	
119,350	500	.1280	.0907	
131,285	550	.1539	.....	
143,220	600	.1790	.....	
155,155	650	.2065	.....	Cracks started 2 inches from upper end of pier.
167,090	700	.2320	.1723	
179,025	750	.2808	.....	
190,960	800	.3060	.....	
202,895	850	.3390	.....	
214,830	900	.3990	.....	
226,765	950	.4395	.....	
230,200	964	.....	.....	Ultimate strength.

Principal injury done the upper third of the pier.

No. 894.

16-inch brick pier.

Built of forty-seven courses of common brick.
Total weight, 2,043 pounds.
Weight per cubic foot, 120.1 pounds.
Total height, 119″.98.
Sectional area, 15″.60×15″.70=244.92 square inches.
Gauged length, 100″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
24,492	100	0.	0.	Initial load.
36,738	150	.0039	.....	
48,984	200	.0091	.....	
61,230	250	.0222	.....	
73,476	300	.0390	.....	
85,722	350	.0575	.....	
97,968	400	.0782	.....	
110,214	450	.1017	.....	
122,460	500	.1290	.0920	
134,706	550	.1581	.....	
146,952	600	.1787	.....	
159,198	650	.2085	.....	
171,444	700	.2364	.1760	Cracks in courses 2 and 4 inches from upper end.
183,690	750	.2720	.....	
195,936	800	.3020	.....	
208,182	850	.3320	.....	
220,428	900	.3610	.....	
232,674	950	.4140	.....	
244,920	1,000	.4640	.....	
247,400	1,010	.....	.....	Ultimate strength.

The principal cracks at failure were confined to the middle part and upper third of the pier.

No. 895.

16-inch, hollow, brick pier.

Built of twenty-eight courses of common brick.
Total weight, 875 pounds.
Weight per cubic foot, 124.3 pounds.
Total height, 72″.68.
Cross-section dimensions..... 15″.45×15″.45=238.70 square inches.
Core ..... 8″.3 × 8″.6 = 71.38 Do.

Sectional area ..... 167.32 Do.
Gauged length, 60″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
16,732	100	0.	0.	Initial load.
25,098	150	.0023	.....	
33,464	200	.0062	.....	
41,830	250	.0113	.....	
50,196	300	.0164	.....	
58,562	350	.0218	.....	
66,928	400	.0281	.....	
75,294	450	.0344	.....	
83,660	500	.0418	.0209	
92,026	550	.0498	.....	
100,392	600	.0578	.....	
108,758	650	.0648	.....	
117,124	700	.0729	.0402	
125,490	750	.0837	.....	
133,856	800	.0900	.....	
142,222	850	.0991	.....	
150,588	900	.1110	.....	Cracks in middle courses.
158,954	950	.1200	.....	
167,320	1,000	.1290	.0790	
175,686	1,050	.1429	.....	
184,052	1,100	.1508	.....	
192,418	1,150	.1604	.....	
200,784	1,200	.1697	.....	
209,150	1,250	.1830	.....	
217,516	1,300	.1950 .2013	....	Sustained pressure one hour; the load in the mean time falling to 101,600 pounds. Load increased to 217,516 pounds, and compression found ″.2013.
225,882	1,350	.2096	.....	
234,248	1,400	.2219	.....	
242,614	1,450	.2338	.....	
250,980	1,500	.2546	.....	
259,346	1,550	.2863	.....	
270,100	1,614	.....	.....	Ultimate strength.

No. 896.

16-inch hollow, brick, pier.

Built of twenty-eight courses of common brick.
Total weight, 870 pounds.
Weight per cubic foot, 125.6 pounds.
Total height, 72″.68.
Cross-section dimensions..... 15″.45×15″.50=239.48 square inches.
Core..... 8″.7 × 8″.6 = 74.28 Do.

Sectional area..... 164.66 Do.
Average thickness of joints, ″.26.
Gauged length, 60″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
16,466	100	0.	0.	Initial load.
24,699	150	.0021	.....	
32,932	100	.0048	.....	
41,165	250	.0083	.....	
49,398	300	.0124	.....	
57,631	350	.0172	.....	
65,864	400	.0221	.....	
74,097	450	.0281	.....	
82,330	500	.0338	.0148	
90,563	550	.0414	.....	
98,796	600	.0480	.....	
107,029	650	.0545	.....	
115,262	700	.0643	.0334	
123,495	750	.0742	.....	
131,728	800	.0815	.....	
139,961	850	.0897	.....	Cracks in middle courses.
148,194	900	.1000	.....	
156,427	950	.1084	.....	
164,660	1,000	.1193	.0710	
172,893	1,050	.1335	.....	
181,126	1,100	.1419	.....	
189,359	1,150	.1489	.....	
197,592	1,200	.1603	.....	
205,825	1,250	.1758	.....	
214,058	1,300	.1876	.....	
222,291	1,350	.2030	.....	
230,524	1,400	.2172	.....	
238,757	1,450	.2315	.....	
246,990	1,500	.2480	.....	
255,223	1,550	.2650	.....	
260,200	1,580	.....	.....	Ultimate strength.

Opened longitudinal seams.

No. 897.

16-inch, hollow, brick pier.

Built of forty-seven courses of common brick.
Total weight, 1,426 pounds.
Weight per cubic foot, 123.4 pounds.
Total height, 119″.25.
Cross-section dimensions ..... 15″.40×15″.40=237.16 square inches.
Core ..... 8″.40× 8″.40= 69.72 Do.

Sectional area ..... 167.44 Do.
Average thickness of joints, ″.27.
Gauged length, 100″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
25,116	150	0.	0.	Initial load.
33,488	200	.0038	.....	
41,860	250	.0088	.....	
50,232	300	.0198	.....	
58,604	350	.0347	.....	
66,976	400	.0510	.....	
75,348	450	.0679	.....	
83,720	500	.0915	.0629	
92,092	550	.1109	.....	
100,464	600	.1391	.....	Snapping sounds.
108,836	650	.1570	.....	
117,208	700	.1821	.....	
125,580	750	.2157	.....	Cracks in ninth, tenth, and eleventh courses from bottom end.
133,952	800	.2461	.....	
142,324	850	.2768	.....	
150,696	900	.3098	.....	
159,068	950	.3430	.....	
167,440	1,000	.3728	.2946	
175,812	1,050	.4200	.....	
184,184	1,100	.4510	.....	
192,556	1,150	.4832	.....	
200,928	1,200	.5289	.....	
212,100	1,267	.....	.....	Ultimate strength.

No. 898.

16-*inch*, *hollow*, *brick pier*.

Built of forty-seven courses of common brick.
Total weight, 1,443 pounds.
Weight per cubic foot, 128.9 pounds.
Total height, 118″.56.
Cross-section dimensions ..... 15″.40 × 15″.45 = 237.93 square inches.
Core ..... 8″.60 × 8″.60 = 74.82 Do.

Sectional area ..... 163.11 Do.
Average thickness of joints, ″.27.
Gauged length, 100″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
24,467	150	0.	0.	Initial load.
32,622	200	.0031	.....	
40,777	250	.0080	.....	
48,933	300	.0129	.....	
57,088	350	.0299	.....	
65,244	400	.0519	.....	
73,399	450	.0763	.....	
81,555	500	.1035	.0738	
89,710	550	.1340	.....	
97,866	600	.1590	.....	
106,021	650	.1910	.....	
114,177	700	.2230	.....	
122,332	750	.2568	.....	
130,488	800	.2890	.....	Cracks opened one quarter length of pier from the bottom.
138,643	850	.3230	.....	
146,799	900	.3560	.....	
154,954	950	.3892	.....	(Rested 10 minutes.)
163,110	1,000	.4300	.....	
171,260	1,050	.4780	.....	
179,421	1,100	.5065	.....	
187,576	1,150	.5490	.....	
195,732	1,200	.5845	.....	Ultimate strength.
202,000	1,238	.....	.....	

Principal lines of failure were confined to the lower half of the pier.

No. 899.

12-inch brick pier.

Built of fifty-six courses of common brick and two bond stones of North River blue-stone 3 inches thick, placed 4 feet apart in the pier.
Total weight, 1,434 pounds.
Weight per cubic foot, 122.3 pounds.
Total height, 150″.5.
Sectional area, 11″.60 × 11″.60 = 134.56 square inches.
Average thickness of joints, ″.28.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
20,184	150	0.	0.	Initial load.
26,912	200	.0025	.....	
40,368	300	.0087	.....	
53,824	400	.0189	.....	
67,280	500	.0329	.0114	
80,736	600	.0508	.....	
94,192	700	.0732	.....	
107,648	800	.0930	.....	
121,104	900	.1200	.....	
134,560	1,000	.1495	.0860	
148,016	1,100	.1858	.....	
161,472	1,200	.2181	.....	
174,928	1,300	.2530	.....	
188,384	1,400	.2980	.....	Fine cracks appear generally distributed along height of the pier.
201,840	1,500	.3390	.....	
215,296	1,600	.3840	.....	One bond stone cracks.
217,200	1,622	.....	.....	Ultimate strength.

No. 900.

12-inch brick pier.

Built of fifty-six courses of common brick and two bond stones of North River blue-stone 3 inches thick, placed 4 feet apart in the pier.
Total weight, 1,434 pounds.
Weight per cubic foot, 125 pounds.
Total height, 150″.5.
Sectional area, 11″.40 × 11″.55 = 131.67 square inches.
Average thickness of joints, ″.27.
Gauged length, 100″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
19,751	150	0.	0.	Initial load.
26,334	200	.0025	.....	
39,501	300	.0101	.....	
52,668	400	.0235	.....	
65,835	500	.0194	.0230	
79,002	600	.0685	.....	
92,169	700	.0978	.....	
105,336	800	.1290	.....	
118,503	900	.1575	.....	Cracks in second, third, and fifth courses from top end.
131,670	1,000	.1925	.1288	
144,837	1,100	.2270	.....	
158,004	1,200	.2640	.....	
171,171	1,300	.3049	.....	Cracks opened at bottom end.
184,338	1,400	.3470	.2480	
185,000	1,405	.....	.....	Crack in one bond stone.
193,300	1,468	.....	.....	Ultimate strength.

No. 901.

8-inch grouted brick pier.

Built of twenty-one courses of common brick in neat cement grout.
Total weight, 203 pounds.
Weight per cubic foot, 117.1 pounds.
Total height, 48″.
Sectional area, 7″.9 × 7″.9 = 62.41 square inches.
Cracks opened at 40,000 pounds compression.
Ultimate strength, 72,300 pounds = 1,158 pounds per square inch.

No. 902.

8-inch grouted brick pier.

Built of twenty-one courses of face brick in neat cement grout.
Total weight, 217 pounds.
Weight per cubic foot, 124 pounds.
Total height, 47¼″.
Sectional area, 8″.00 × 8″.00 = 64.00 square inches.
Ultimate strength, 105,800 pounds = 1,654 pounds per square inch.

No. 903.

12-inch, hollow, brick pier.

Built of thirty-three courses of face brick laid without mortar.
Total weight, 610 pounds.
Weight per cubic foot, 124.5 pounds.
Total height, 73″.1.

Cross-section dimensions	11″.55 × 11″.55 = 133.40	square inches.
Core	4″.2 × 4″.2 = 17.64	Do.
Sectional area	115.76	Do.

Ultimate strength, 60,800 pounds = 525 pounds per square inch.

Cracks were opened, under a load of 5,000 pounds, through the middle of the bricks, opposite the end joints of the adjacent courses, in a manner similar to the fractures of piers laid in mortar.

The cracks rapidly increased with the loads, while the contact surfaces between the bricks increased.

Under the maximum load there were numerous fractures throughout the pier, and partial crushing and flaking of the individual bricks.

TABULATION OF THE CRUSHING STRENGTH OF FACE BRICK PIERS.

No. of test.	Nominal dimensions.		Composition of mortar.	Weight per cubic foot.	Actual dimensions.			Sectional area.	Ultimate strength.			
	Height.	Cross-section.			Height.	Cross-section.			Total.	Per sq. inch.	Per sq. foot.	Single brick.
	Feet.	*Inches.* *Inches.*		*Pounds.*	*Feet.* *In.*	*Inches.*	*Inches.*	*Sq. inch.*	*Pounds.*	*Pounds.*	*Tons.*	*Per cent.*
851	2	8 8	Cement 1, sand 2	132.7	2 0.	7.63	7.61	58.06	141,000	2,428	174.81	18.1
852	2	8 8	....do	134.4	2 0.27	7.64	7.63	58.29	123,400	2,117	152.42	15.8
853	4	8 8	....do	130.2	3 11.95	7.75	7.68	59.52	122,016	2,050	147.60	15.3
854	4	8 8	....do	129.7	4 0	7.75	7.70	59.68	116,000	1,944	139.97	14.5
855	6	8 8	....do	127.6	6 0.37	7.75	7.75	60.06	117,117	1,950	140.4	14.6
856	6	8 8	....do	129.6	6 0.26	7.85	7.75	60.84	106,470	1,750	126.0	13.1
857	8	8 8	....do	125.2	8 0.56	7.78	7.75	60.30	102,000	1,691	121.75	12.6
858	10	8 8	....do	.....	9 11.27	7.80	7.70	60.06	100,749	1,677	120.77	12.5
859	10	8 8	....do	126.8	10 0.37	7.82	7.80	61.00	110,500	1,811	130.39	13.5
*860	6	12 12	....do	126.4	5 11.68	11.60	11.60	134.56	257,300	1,912	137.66	14.3
861	6	12 12	....do	129.0	5 11.27	11.55	11.50	132.82	258,100	1,943	139.89	14.5
862	6	12 12 4 4	....do	130.3	5 11	11.55 4.20	11.50 4.10	115.61	219,659	1,900	136.8	14.2
863	6	16 16	....do	129.5	5 10.09	15.45	15.40	237.98	499,653	2,100	151.2	15.7
*864	6	16 16	....do	126.0	5 11.81	15.45	15.35	237.16	468,700	1,976	142.27	14.7

* Core built of common brick.

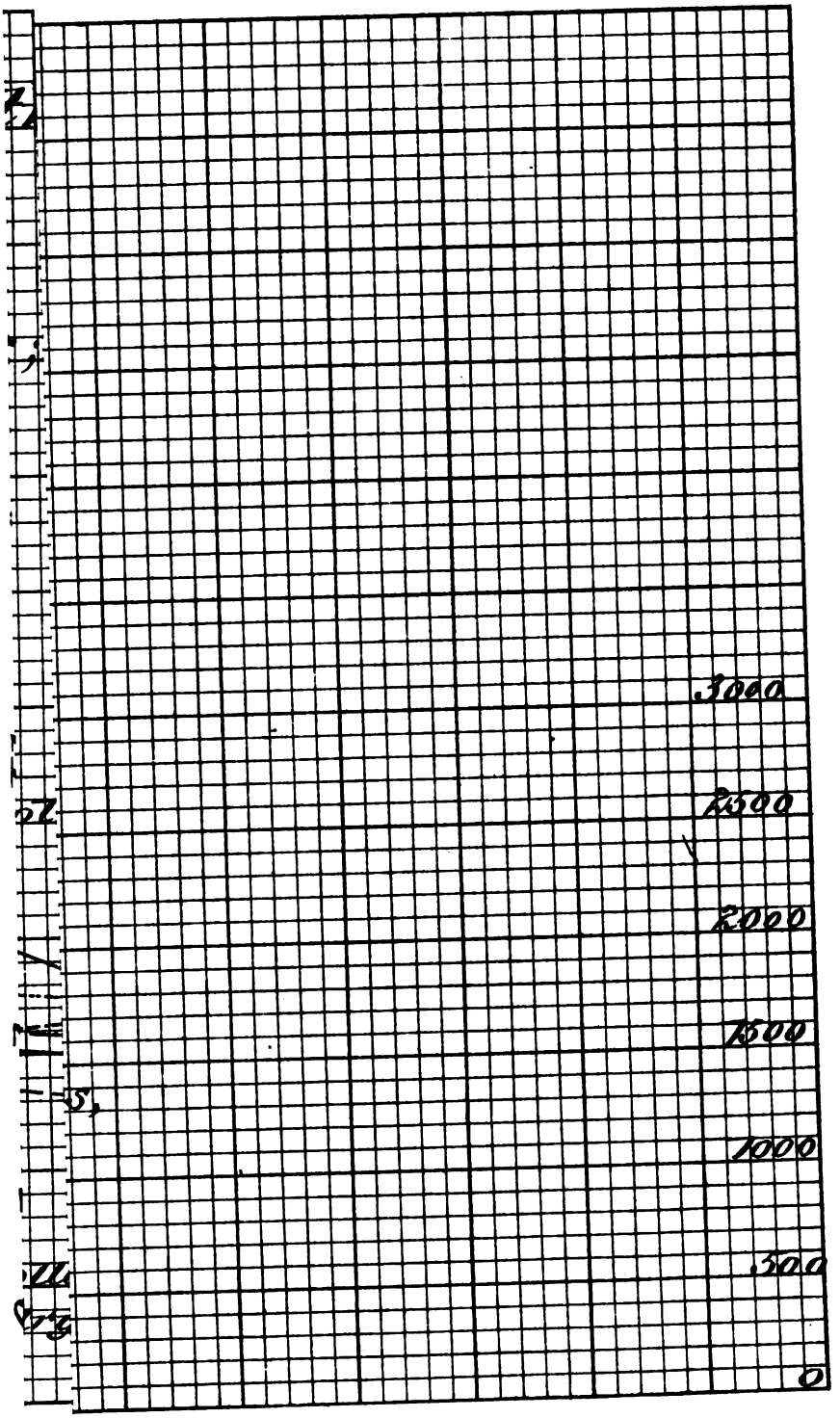
TABULATION OF THE CRUSHING STRENGTH OF COMMON BRICK PIERS.

865	2	8	8	Cement 1, sand 2	120.8	1 10.87	7.65	7.52	57.53	161,000	2,798	201.45	17.6
866	2	8	8	....do	123.3	1 11.13	7.65	7.60	58.14	157,800	2,714	195.40	17.1
867	4	8	8	....do	125.4	4 0.37	7.60	7.55	57.38	111,891	1,950	140.40	12.3
868	4	8	8	....do	124.6	3 11.62	7.68	7.58	58.21	101,867	1,750	126.00	11.0
869	6	8	8	....do	121.5	6 1.02	7.65	7.60	58.14	144,300	2,481	178.63	15.6
870	6	8	8	....do	123.3	6 1.18	7.60	7.58	57.61	132,503	2,300	165.60	14.5
871	8	8	8	....do	121.4	8 1.50	7.65	7.68	58.37	90,474	1,550	111.60	9.7
872	8	8	8	....do	121.4	7 11.98	7.60	7.55	57.38	90,800	1,582	113.90	10.0
873	10	8	8	....do	121.0	10 0.93	7.60	7.55	57.38	80,070	1,500	108.00	9.4
874	10	8	8	....do	123.1	10 1.31	7.60	7.55	57.38	104,200	1,815	130.68	11.4
875	2	12	12	....do	123.5	1 11.06	11.60	11.40	132.24	307,800	2,327	167.54	14.7
876	2	12	12	....do	125.8	1 10.75	11.38	11.35	129.16	318,500	2,466	177.55	15.5
877	4	12	12	....do	124.9	3 11.58	11.55	11.50	132.83	224,100	1,687	121.46	10.8
878	4	12	12	....do	125.1	3 11.81	11.40	11.30	128.82	251,199	1,950	140.40	12.3
879	6	12	12	....do	123.2	6 0.75	11.45	11.45	131.10	222,870	1,700	122.40	10.7
880	6	12	12	....do	121.7	6 0.75	11.48	11.45	131.45	216,200	1,644	118.36	10.3
881	8	12	12	....do	121.6	8 1.37	11.45	11.40	130.53	190,700	1,461	105.19	9.2
882	8	12	12	....do	120.8	8 0.75	11.50	11.40	131.10	211,100	1,610	115.92	10.1

TABULATION OF THE CRUSHING STRENGTH OF COMMON BRICK PIERS—Continued.

No. of test.	Nominal dimensions.		Composition of mortar.	Weight per cubic foot.	Actual dimensions.		Sectional area.	Ultimate strength.			
	Height.	Cross-section.			Height.	Cross-section.		Total.	Per sq. inch.	Per sq. foot.	Single brick.
	Feet.	*Inches.* *Inches.*		*Pounds.*	*Feet.* *In.*	*Inches.* *Inches.*	*Sq. inch.*	*Pounds.*	*Pounds.*	*Tons.*	*Per cent.*
883	10	12 12	Cement 1, sand 2	119.5	10 1.00	11.55 11.45	132.25	178,200	1,347	96.98	8.5
884	2	12 12 4 4	do	126.2	1 11.00	11.40 11.40 4.55 4.50	109.48	271,500	2,480	178.56	15.7
885	2	12 12 4 4	do	127.7	2 1.12	11.45 11.40 4.90 4.55	108.23	265,400	2,452	176.54	15.5
886	4	12 12 4 4	do	127.3	4 0.18	11.35 11.35 4.70 4.70	106.73	198,100	1,856	133.63	11.7
887	4	12 12 4 4	do	127.7	3 11.98	11.45 11.40 4.80 4.70	107.97	215,200	1,993	143.49	12.5
888	6	12 12 4 4	do	118.8	6 0.75	11.35 11.35 4.90 4.60	106.28	164,100	1,525	110.52	9.6
889	8	12 12 4 4	do	124.3	8 2.18	11.50 11.50 4.90 4.80	108.73	181,841	1,700	122.40	10.7
890	10	12 12 4 4	do	125.1	10 2.27	11.50 11.40 4.80 4.80	108.06	157,500	1,457	104.90	9.2
891	6	16 16	do	123.0	6 1.18	15.50 15.45	239.48	358,200	1,495	107.64	9.4
892	6	16 16	do	121.8	6 1.37	15.70 15.65	245.71	356,600	1,451	104.49	9.1
893	10	16 16	do	123.7	9 11.00	15.50 15.40	238.70	230,200	964	69.41	6.1
894	10	16 16	do	129.1	9 11.98	15.70 15.60	244.92	247,460	1,010	72.72	6.3
895	6	16 16 8 8	do	124.3	6 0.68	15.45 15.45 8.60 8.30	167.32	270,100	1,614	116.21	10.2
896	6	16 16 8 8	do	125.6	6 0.68	15.50 15.45 8.70 8.60	164.66	260,200	1,580	113.76	9.9
897	10	16 16 8 8	do	123.4	9 11.25	15.40 15.40 8.40 8.30	167.44	212,100	1,267	91.22	8.0
898	10	16 16 8 8	do	128.9	9 10.56	15.45 15.40 8.70 8.60	168.11	202,000	1,238	89.14	7.8
*899	12½	12 12	do	122.3	12 6.5	11.60 11.60	134.56	217,200	1,622	116.78	10.2
*900	12½	12 12	do	125.6	12 6.5	11.55 11.40	131.67	193,300	1,468	105.69	9.2
†901	4	8 8	Neat cement grout	117.1	4 6.	7.90 7.90	62.41	72,300	1,158	83.37	7.3
‡902	4	8 8	do	124.0	*3 11.25	8.00 8.00	64.00	105,800	1,654	119.09	12.3
§903	6	12 12 4 4	Without mortar	124.5	6 1.1	11.55 11.55 4.20 4.20	115.76	60,800	525	37.80	3.9

* Laid with bond stones 4 feet apart.
† Common brick pier grouted.
‡ Face brick pier grouted.
§ Face brick pier, laid without mortar.

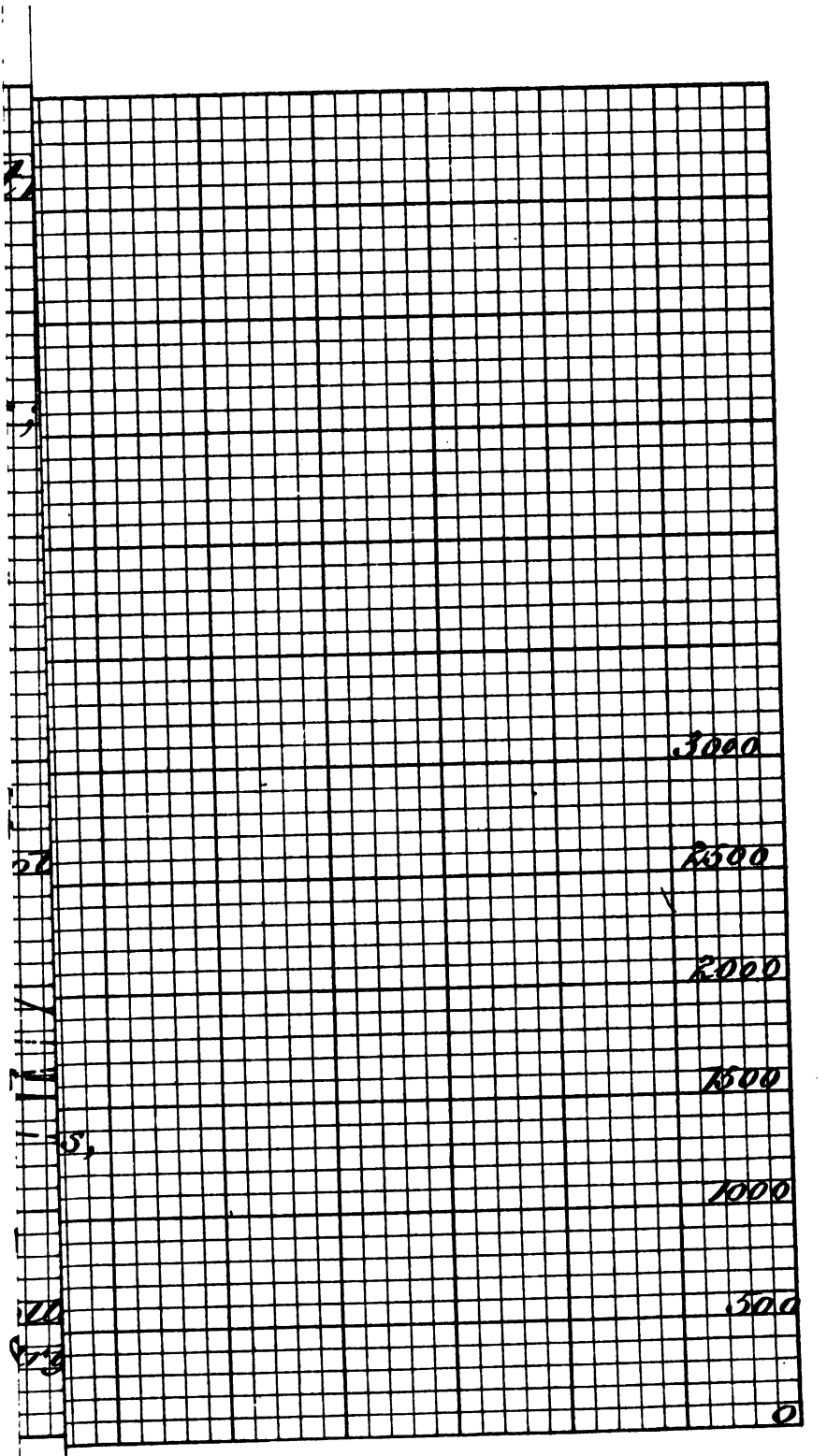


H Ex 31 49 2

TABULATION OF THE CRUSHING STRENGTH OF COMMON BRICK PIERS—Continued.

No. of test.	Nominal dimensions.		Composition of mortar.	Weight per cubic foot.	Actual dimensions.			Sectional area.	Ultimate strength.			
	Height.	Cross-section.			Height.	Cross-section.			Total.	Per sq. inch.	Per sq. foot.	Single brick.
	Feet.	*Inches.* *Inches.*		*Pounds.*	*Feet.* *In.*	*Inches.*	*Inches.*	*Sq. inch.*	*Pounds.*	*Pounds.*	*Tons.*	*Per cent.*
883	10	12 12	Cement 1, sand 2	119.5	10 1.00	11.55	11.45	132.25	178,200	1,347	96.98	8.5
884	2	12 12 4 4	do	126.2	1 11.00	11.40 4.55	11.40 4.50	109.48	271,500	2,480	178.56	15.7
885	2	12 12 4 4	do	127.7	2 1.12	11.45 4.90	11.40 4.55	108.23	265,400	2,452	176.54	15.5
886	4	12 12 4 4	do	127.3	4 0.18	11.35 4.70	11.35 4.70	106.73	198,100	1,856	133.63	11.7
887	4	12 12 4 4	do	127.7	3 11.98	11.45 4.80	11.40 4.70	107.97	215,200	1,993	143.49	12.5
888	6	12 12 4 4	do	118.8	6 0.75	11.35 4.90	11.35 4.60	106.28	164,100	1,525	110.52	9.6
889	8	12 12 4 4	do	124.3	8 3.18	11.50 4.90	11.50 4.80	108.73	184,841	1,700	122.40	10.7
890	10	12 12 4 4	do	125.1	10 2.27	11.50 4.80	11.40 4.80	108.00	157,500	1,457	104.90	9.2
891	6	16 16	do	123.0	6 1.18	15.50	15.45	239.48	358,200	1,495	107.64	9.4
892	6	16 16	do	121.8	6 1.37	15.70	15.65	245.71	356,600	1,451	104.49	9.1
893	10	16 16	do	123.7	9 11.00	15.50	15.40	238.70	230,200	964	69.41	6.1
894	10	16 16	do	120.1	9 11.98	15.70	15.60	244.92	247,400	1,010	72.72	6.3
895	6	16 16 8 8	do	124.3	6 0.68	15.45 8.60	15.45 8.30	167.32	270,100	1,614	116.21	10.2
896	6	16 16 8 8	do	125.6	6 0.68	15.50 8.70	15.45 8.60	164.66	260,200	1,580	113.76	9.9
897	10	16 16 8 8	do	123.4	9 11.25	15.40 8.40	15.40 8.30	167.44	212,100	1,267	91.22	8.0
898	10	16 16 8 8	do	128.9	9 10.56	15.45 8.70	15.40 8.60	163.11	202,000	1,238	89.14	7.8
*899	12½	12 12	do	122.3	12 6.5	11.60	11.60	134.56	217,200	1,622	116.78	10.2
*900	12½	12 12	do	125.0	12 6.5	11.55	11.40	131.67	193,300	1,468	105.69	9.2
†901	4	8 8	Neat cement grout	117.1	4 0.	7.90	7.90	62.41	72,300	1,158	83.37	7.3
‡902	4	8 8	do	124.0	*3 11.25	8.00	8.00	64.00	105,800	1,654	119.09	12.3
§903	6	12 12 4 4	Without mortar	124.5	6 1.1	11.55 4.20	11.55 4.20	115.76	60,800	525	37.80	3.9

* Laid with bond stones 4 feet apart.
† Common brick pier grouted.
‡ Face brick pier grouted.
§ Face brick pier, laid without mortar.



H Ex 31 49 2

TENSILE TESTS OF O. H. STEEL BOILER-PLATES.

[NOTE.—Lengthwise specimens marked L; crosswise specimens marked C.]

No. of test.	Mark on specimen.	Dimensions.		Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 10 inches.		Area at fracture.		Contraction of area.	Appearance of fracture.	Elongation of inch sections.									
		Width.	Thickness.		Total.	Per square inch.	Total.	Per square inch.			Dimensions.	Area.												
		Inches.	*Inch.*	*Sq.in.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Inch.*	*P. ct.*	*Inches.*	*Sq.in.*	*P. ct.*		"	"	"	"	"	"	"	"	"	"
1064	L	1.500	.378	.567	19,550	34,480	31,780	56,050	8.19	31.9	1.06×.24	.254	55.2	Silky	.27	.30	.25	.25	.24	.31	*.74	.32	.26	.25
1065	C	1.497	.405	.606	24,600	40,590	37,400	61,720	1.97	19.7	1.10×.28	.308	49.1	Silky, slight lamination	.28	.28	.19	.19	.19	.18	.17	.18	.18	.18
1066	L	1.497	.367	.549	19,480	35,480	31,300	57,010	2.52	25.2	1.06×.22	.233	57.5	Silky	*.69	.28	.28	.27	.25	.25	.17	.16	.12	.10
1067	C	1.498	.391	.589	21,600	36,860	35,080	59,860	2.21	22.1	1.10×.25	.275	53.0	Silky, slight lamination	.26	*.64	.21	.19	.16	.17	.17	.15	.14	.12
1068	L	1.500	.377	.566	22,100	39,050	34,250	60,510	2.76	27.6	1.06×.23	.244	56.8	Silky	.26	*.65	.26	.21	.23	.24	.23	.22	.21	.25
1069	C	1.499	.400	.600	19,900	33,170	35,450	59,080	2.59	25.9	1.06×.26	.276	54.0	Silky, slight lamination	.25	*.67	.32	.21	.22	.19	.17	.19	.19	.18
1070	L	1.493	.380	.567	20,080	35,410	33,370	58,850	2.36	23.6	1.09×.25	.273	51.8	Silky, very lamellar	.22	.26	*.63	.28	.20	.16	.15	.14	.17	.15
1071	C	1.500	.402	.603	20,700	36,900	35,500	58,870	2.37	23.7	1.12×.27	.302	49.9	Silky, lamellar	*.41	.50	.22	.24	.17	.17	.16	.16	.17	.17
1072	L	1.496	.375	.561	20,800	37,080	31,000	56,330	2.57	25.7	1.13×.22	.249	55.6	do	.32	*.61	.25	.20	.16	.18	.17	.21	.23	.24
1073	C	1.496	.400	.598	21,250	35,540	34,050	56,940	2.93	29.3	1.12×.27	.302	49.4	do	.27	.28	.35	.55	.43	.24	.24	.22	.19	.16
1074	L	1.500	.293	.440	16,100	36,590	24,510	55,700	2.43	24.3	1.10×.18	.198	55.0	Silky, very lamellar	.17	.15	.19	.21	.31	*.66	.23	.18	.17	.16
1075	C	1.500	.343	.515	21,600	41,940	29,900	58,060	2.28	22.8	1.23×.26	.320	37.8	do	.21	*.49	.22	.20	.20	.19	.17	.19	.21	.20
1076	L	1.502	.308	.463	19,580	42,290	28,420	61,380	1.89	18.9	1.10×.20	.220	52.4	Silky	.22	.19	.18	.15	.17	.18	.19	.21	.19	.21
1077	C	1.500	.347	.521	21,300	40,880	32,250	61,960	2.59	25.9	1.14×.24	.274	47.4	do	.21	.20	.24	*.56	.37	.21	.19	.18	.20	.23
1078	L	1.500	.307	.461	18,400	39,910	26,240	56,920	2.31	23.1	1.07×.18	.193	58.1	do	.38	.24	.21	.24	.22	.22	.21	.20	.20	.19
1079	C	1.500	.350	.525	20,250	38,570	31,520	60,040	1.79	17.9	1.12×.23	.258	50.8	Silky, lamellar	.21	.18	.14	.16	.20	.19	.20	.16	.17	.18
1080	L	1.500	.314	.471	18,400	39,070	27,940	59,320	2.74	27.4	1.06×.20	.212	54.9	do	*.67	.25	.25	.25	.25	.22	.18	.19	.23	.25
1081	C	1.500	.342	.513	20,650	40,250	31,200	60,820	2.32	23.2	1.10×.22	.242	52.8	Silky	*.64	.36	.21	.17	.20	.16	.18	.15	.13	.12
1082	L	1.500	.308	.462	18,600	40,260	28,020	60,650	2.81	28.1	1.09×.19	.207	55.1	Fine silky	.20	.23	.29	*.66	.28	.26	.27	.23	.20	.19
1083	C	1.505	.314	.473	18,300	38,690	28,700	60,680	2.33	23.3	1.11×.20	.222	53.0	Silky	.20	.27	*.61	.24	.18	.18	.14	.17	.18	.16
1084	L	1.500	.307	.461	18,280	39,670	27,270	59,150	2.61	26.4	1.08×.19	.205	55.5	Silky, slight lamination	*.57	.40	.22	.19	.18	.19	.21	.22	.23	.23
1085	C	1.505	.343	.516	21,500	41,670	29,400	56,980	1.46	14.6	1.12×.23	.258	50.0	Silky, lamellar	.19	.15	.14	.13	.13	.14	.15	.15	.13	.15
1086	L	1.500	.306	.459	16,980	36,990	26,100	56,860	2.09	25.9	1.10×.19	.209	54.4	Fine silky	.25	*.43	*.53	.24	.20	.19	.18	.19	.19	.17
1087	C	1.500	.312	.468	19,200	41,030	27,980	59,790	2.57	25.7	1.10×.19	.209	55.3	Silky, slight lamination	.23	*.61	.30	.24	.19	.21	.23	.21	.19	.16
1088	L	1.505	.305	.459	17,800	38,780	25,100	54,680	2.76	27.6	1.10×.17	.187	59.2	Silky	.23	.23	.25	*.69	.28	.23	.22	.21	.21	.21
1089	C	1.505	.348	.524	21,000	40,080	31,750	60,590	2.51	25.1	1.10×.24	.264	49.6	do	.31	*.64	.29	.26	.23	.18	.15	.16	.15	.14
1090	L	1.506	.304	.458	19,100	41,700	29,840	65,150	2.81	28.1	1.09×.19	.207	54.8	do	.26	.26	*.48	.49	.28	.26	.20	.20	.19	.19
1091	C	1.505	.310	.467	18,380	39,360	28,460	60,940	2.37	23.7	1.12×.20	.224	52.0	Silky, slight lamination	*.53	.18	.21	.18	.19	.21	.22	.23	.21	.21
1092	L	1.500	.304	.456	17,480	38,340	26,880	58,950	2.68	26.8	1.18×.19	.224	50.8	Silky	.26	.25	.25	.25	*.61	.27	.22	.21	.19	.17
1093	C	1.506	.336	.506	18,600	36,760	27,860	55,060	2.73	27.3	1.14×.22	.251	50.3	Silky, lamellar	.22	.20	.34	.32	*.61	.28	.24	.19	.17	.16
1094	L	1.503	.306	.460	17,200	37,390	26,350	57,280	1.63	16.3	1.16×.18	.209	54.5	do	.19	.15	.16	.15	.16	.17	.16	.17	.16	.16
1095	C	1.501	.354	.531	20,100	37,250	31,900	60,080	2.17	21.7	1.14×.25	.285	46.3	Silky, very lamellar	.26	*.58	.26	.19	.15	.15	.14	.14	.14	.16
1096	L	1.501	.301	.452	17,700	39,160	26,650	58,960	2.21	22.1	1.18×.18	.212	53.1	Silky	.18	.33	*.52	.34	.22	.17	.14	.15	.13	.13
1097	C	1.501	.333	.500	18,800	37,600	29,080	58,160	1.77	17.7	1.10×.21	.231	53.8	do	.24	.20	.19	.20	.18	.16	.16	.15	.15	.14
1098	L	1.503	.312	.469	20,750	44,240	29,600	63,110	2.38	23.8	1.15×.20	.230	50.9	Silky, slightly lamellar	.25	*.62	.20	.13	.15	.17	.21	.23	.22	.20
1099	C	1.500	.350	.525	23,200	44,190	33,700	64,190	1.93	19.3	1.15×.24	.276	47.7	Silky	*.52	.21	.16	.12	.11	.14	.13	.17	.22	.15
1100	L	1.504	.374	.562	18,180	32,350	29,750	52,940	2.92	29.2	1.06×.23	.244	56.5	Silky, very lamellar	.33	.22	.25	.25	.23	.18	.16	.19	.21	.2$_2$

* Indicates fractured section.

TENSILE TESTS OF O. H. STEEL BOILER-PLATES.—Continued.

No. of test.	Mark on specimen.	Dimensions.		Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 10 inches.		Area at fracture.		Contraction of area.	Appearance of fracture.	Elongation of inch sections.									
		Width.	Thickness.		Total.	Per square inch.	Total.	Per square inch.			Dimensions.	Area.												
		Inches.	*Inch.*	*Sq.in.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Inch.*	*P. ct.*	*Inches.*	*Sq.in.*	*P. ct.*		"	"	"	"	"	"	"	"	"	"
1101	C	1.505	.388	.584	18,780	32,160	31,710	54,300	2.24	22.4	1.09×.24	.262	55.1	Silky, very lameller	.26	.23	.24	*.44	.63	.30	.26	.19	.17	.20
1740	L	1.496	.380	.568	22,380	39,400	35,320	62,180	2.79	27.9	1.07×.24	.257	54.7	Silky	.18	.20	.33	*.65	.26	.26	.29	.24	.20	.18
1741	C	1.495	.368	.550	21,500	39,090	33,900	61,640	1.94	19.4	1.09×.25	.273	50.3	.....do	.23	.22	.20	.21	.18	.17	.18	.18	.19	.18
1742	L	1.500	.370	.555	21,350	38,470	33,200	59,820	1.91	19.1	1.08×.23	.248	55.3	.....do	.28	.19	.16	.18	.18	.17	.20	.20	.17	.18
1743	C	1.498	.377	.565	19,460	34,440	32,080	56,780	2.75	27.5	1.10×.25	.275	52.3	.....do	.38	*.63	.26	.22	.25	.25	.22	.18	.19	.17
1744	L	1.500	.366	.549	22,300	40,620	34,500	62,810	2.68	26.8	1.10×.24	.264	51.9	Silky, slight lamination	*.64	.25	.18	.16	.19	.19	.24	.27	.30	.26
1745	C	1.505	.366	.551	22,590	41,000	33,720	61,200	2.78	27.8	1.15×.27	.316	42.6	Silky, lamellar	.21	.26	*.51	.37	.26	.27	.24	.24	.22	.20
1746	L	1.504	.354	.532	22,700	42,670	31,850	59,870	2.79	27.9	1.08×.22	.238	55.2	Silky	.27	.28	.35	*.69	.25	.23	.20	.17	.17	.18
1747	C	1.504	.366	.550	22,980	41,780	34,800	63,270	2.28	22.8	1.16×.23	.267	51.4	Silky, trace of lamination	.27	*.62	.24	.19	.19	.17	.15	.16	.14	.15
1748	L	1.503	.365	.549	21,460	39,090	33,450	60,930	2.37	23.7	1.10×.24	.264	51.9	Silky, slight lamination	*.48	*.51	.23	.18	.16	.15	.16	.15	.17	.18
1749	C	1.503	.388	.583	25,900	44,430	36,090	61,900	2.23	22.3	1.13×.27	.305	47.6	Silky, lamellar	.28	.20	.23	.21	.20	.22	.20	.22	.22	.25
1750	L	1.503	.292	.438	18,720	42,740	26,750	61,070	2.50	25.0	1.21×.17	.206	53.0	Silky	.21	*.60	.28	.22	.22	.22	.25	.19	.18	.16
1751	C	1.506	.329	.495	20,080	40,570	29,760	60,120	2.48	24.8	1.13×.23	.260	47.5	Silky, trace of lamination	.16	.25	*.58	.19	.21	.19	.24	.20	.21	.25
1752	L	1.504	.298	.448	18,980	42,370	29,370	65,560	2.37	23.7	1.16×.19	.220	50.7	Silky	*.58	.22	.18	.16	.17	.20	.22	.24	.19	.21
1753	C	1.502	.328	.493	21,100	42,800	31,380	63,650	1.49	14.9	1.15×.23	.265	46.3	.....do	.19	.20	.18	.16	.14	.13	.13	.13	.11	.12
1754	L	1.512	.299	.452	18,420	40,750	29,800	65,930	1.74	17.4	1.20×.20	.240	46.9	Silky, trace of lamination	*.38	*.39	.17	.13	.12	.11	.11	.11	.10	.12
1755	C	1.510	.333	.503	22,040	43,820	31,980	63,580	1.88	18.8	1.21×.23	.278	44.6	Silky, slight lamination	.26	*.50	.17	.16	.15	.14	.14	.15	.12	.09
1756	L	1.511	.301	.455	18,850	41,430	27,460	60,350	1.42	14.2	1.19×.19	.226	50.2	Fine silky	.15	.15	.17	.14	.12	.12	.13	.14	.16	.14
1757	C	1.508	.336	.507	21,500	42,410	31,800	62,720	2.04	20.4	1.18×.24	.283	44.1	Silky	*.57	.22	.18	.17	.15	.19	.15	.15	.14	.12
1758	L	1.512	.292	.442	17,940	40,590	25,880	58,550	1.24	12.4	1.18×.17	.201	54.6	.....do	.20	.17	.13	.12	.10	.10	.10	.11	.10	.11
1759	C	1.501	.326	.490	21,400	43,670	29,700	60,610	2.40	24.0	1.16×.23	.267	45.5	Silky, trace of lamination	.22	*.56	.25	.24	.24	.20	.17	.16	.19	.17
1760	L	1.502	.290	.436	18,450	42,320	26,890	61,670	1.63	16.3	1.15×.17	.196	55.1	Silky	.27	.25	.19	.15	.12	.14	.14	.13	.12	.12
1761	C	1.500	.323	.485	20,900	43,090	30,260	62,390	2.07	20.7	1.16×.24	.278	42.6	Silky, slight lamination	.30	*.53	.24	.19	.16	.16	.13	.11	.12	.13
1762	L	1.505	.281	.423	16,040	37,920	25,480	60,240	2.54	25.4	1.16×.18	.209	50.6	Silky	.19	.22	.26	.26	.31	*.58	.24	.17	.16	.15
1763	C	1.500	.286	.429	16,570	38,620	25,820	60,190	1.99	19.9	1.15×.19	.219	49.0	.....do	*.56	.22	.21	.15	.15	.17	.13	.13	.12	.15
1764	L	1.490	.288	.429	17,380	40,510	26,960	62,890	2.26	22.6	1.16×.17	.197	54.0	.....do	.17	.15	.15	.15	.12	.19	.24	*.64	.26	.19
1765	C	1.504	.291	.438	17,320	39,540	27,100	61,870	1.63	16.3	1.16×.20	.232	47.0	.....do	.19	.15	.18	.17	.18	.15	.17	.17	.15	.12
1766	L	1.494	.305	.456	19,900	43,640	28,280	62,020	2.29	22.9	1.16×.19	.220	51.6	.....do	.14	.15	.14	.18	.23	*.59	.28	.18	.19	.21
1767	C	1.492	.335	.500	21,320	42,640	31,400	62,800	2.04	20.4	1.24×.25	.310	38.0	Silky, slight lamination	*.49	.30	.18	.13	.14	.16	.17	.17	.15	.15
1768	L	1.492	.298	.445	16,750	37,640	26,200	58,880	1.33	13.3	1.29×.17	.219	50.7	Silky, surface pitted; broke at indentation.	.19	*.38	.12	.10	.11	.11	.10	.06	.09	.07
1769	C	1.494	.335	.500	21,450	42,900	31,710	63,420	2.30	23.0	1.16×.22	.255	48.9	Silky	.16	.17	.21	.25	.22	*.46	.29	.15	.19	.18
1770	L	1.503	.300	.452	20,180	44,650	30,000	66,370	1.97	19.7	1.18×.23	.271	56.2	.....do	.20	.32	*.51	.21	.16	.12	.11	.10	.09	.15
1771	C	1.502	.382	.490	20,710	41,500	30,780	61,680	1.35	13.5	1.15×.19	.219	39.9	.....do	.18	.15	.15	.12	.10	.13	.14	.12	.12	.14
1772	L	1.501	.299	.449	15,800	35,190	24,600	54,700	2.27	22.7	1.09×.15	.164	63.5	.....do	.15	.19	.23	*.69	.17	.15	.17	.17	.17	.18
1773	C	1.495	.307	.459	14,840	32,330	24,950	54,360	2.22	22.2	1.20×.20	.240	47.7	.....do	*.45	.37	.20	.18	.19	.19	.20	.16	.14	.14
1774	L	1.505	.295	.444	16,300	36,710	23,700	53,380	1.43	14.3	1.11×.16	.178	60.0	.....do	.17	.15	.17	.17	.13	.13	.11	.12	.13	.15
1775	C	1.508	.310	.467	16,380	35,070	25,840	55,330	1.68	16.8	1.12×.20	.224	52.0	.....do	.17	.15	.16	.18	.19	.18	.16	.12	.18	.19
1776	L	1.508	.363	.547	19,500	35,650	29,440	53,820	1.68	16.8	1.06×.22	.233	58.2	.....do	.29	.21	.18	.18	.14	.14	.15	.14	.13	.12
1777	C	1.509	.371	.560	16,700	29,820	30,300	54,110	2.42	24.2	1.10×.25	.275	50.8	.....do	.23	.24	.27	*.65	.23	.20	.17	.17	.15	.11
1778	L	1.496	.301	.450	16,800	37,330	25,500	56,670	1.67	16.7	1.08×.18	.194	56.8	.....do	*.45	*.46	.13	.14	.10	.09	.06	.05	.08	.11

1779	C	1.494	.318	.475	13,800	29,050	24,100	50,740	1.44	14.4	1.17×.19	.222	53.2	Silky, slight lamination	.18	.19	.23	.24	.16	.09	.07	.08	.08	.12
1780	L	1.499	.291	.436	15,720	36,060	24,210	55,530	1.56	15.6	1.08×.17	.184	57.7	Silky	.26	.22	.16	.15	.12	.15	.16	.11	.10	.13
1781	C	1.502	.300	.451	14,480	32,110	23,520	52,150	1.23	12.3	1.14×.19	.217	51.9	do	.17	.16	.10	.08	.10	.15	.13	.12	.11	.11
1782	L	1.507	.348	.524	20,100	38,360	32,140	61,340	2.34	23.4	1.12×.21	.239	55.6	do	.18	.20	.22	.20	.17	.24	*.62	.19	.16	.16
1783	C	1.507	.362	.546	19,500	35,710	33,180	60,770	2.27	22.7	1.15×.24	.276	49.4	do	*.20	*.40	*.37	.14	.23	.34	.13	.15	.14	.17
1784	L	1.511	.370	.559	22,400	40,070	31,980	57,210	2.27	22.7	1.13×.20	.226	59.5	Silky, slight lamination	.19	.12	.17	*.60	.29	.15	.16	.16	.19	.24
1785	L	1.505	.382	.575	18,960	32,970	32,460	56,450	2.33	23.3	1.12×.26	.291	49.3	Silky	.17	.25	*.58	.20	.22	.20	.20	.20	.16	.15
1786	L	1.511	.349	.527	18,880	35,830	27,550	52,280	2.32	23.2	1.08×.18	.194	63.1	do	.28	*.72	.19	.17	.14	.15	.15	.17	.17	.18
1787	C	1.510	.359	.542	17,820	32,880	27,780	51,250	2.70	27.0	1.08×.22	.238	56.2	do	.24	*.71	.25	.26	.24	.21	.21	.20	.20	.18
1788	L	1.516	.288	.437	16,800	38,440	26,120	59,770	2.34	23.4	1.11×.17	.189	56.8	do	.13	.18	.21	.16	*.51	.31	.18	.22	.27	.17
1789	C	1.510	.315	.476	15,650	32,880	25,080	52,690	1.82	18.2	1.21×.23	.278	41.5	Silky, seam 1 inch wide	.15	.15	*.42	.17	.16	.16	.17	.17	.15	.12
1789a	L	1.509	.288	.435	15,700	36,090	22,800	52,410	1.56	15.6	1.05×.15	.158	63.7	Silky	.24	.14	.19	.16	.16	.17	.15	.12	.12	.11
1790	L	1.500	.282	.423	14,600	34,520	22,110	52,270	2.29	22.9	1.11×.19	.211	50.1	Silky, slight lamination	.21	*.63	.31	.18	.18	.17	.14	.16	.15	.16
1791	L	1.466	.286	.419	16,250	38,780	23,620	56,370	1.93	19.3	1.08×.17	.184	56.1	Silky	*.68	.23	.18	.14	.10	.10	.10	.11	.14	.15
1792	L	1.508	.298	.449	17,300	38,530	24,860	55,370	.63	6.3	Broke at chisel mark.			do	.10	.08	.08	.07	.07	.07	.07	.06	.02	.01
1793	L	1.509	.358	.540	20,950	38,800	30,180	55,890	1.79	17.9	1.07×.21	.225	58.3	do	.15	.18	.19	.16	.18	.16	.17	.19	.22	.19
1794	C	1.509	.372	.561	16,900	36,120	30,100	53,650	1.71	17.1	Broke at chisel mark.			do	.16	.16	.16	.15	.15	.19	.28	.20	.17	.14
1795	L	1.514	.300	.454	14,650	32,270	24,100	53,080	1.82	18.2	1.17×.20	.234	48.4	Silky, laminated	.85	.28	.26	.30	.23	.17	.13	.08	.04	.03
1796	C	1.500	.296	.444	16,980	38,240	24,900	56,080	2.54	25.4	1.07×.18	.193	56.6	Silky	.22	.26	*.65	.32	.17	.16	.18	.17	.20	.21
1797	L	1.470	.260	.382	15,250	39,920	20,190	52,850	1.28	12.8	1.10×.13	.143	62.5	Silky, slight lamination	.30	.24	.17	.12	.09	.06	.06	.08	.07	.09
1798	C	1.515	.298	.451	15,240	33,790	23,680	53,510	2.53	25.3	1.16×.21	.244	45.9	do	.60	.31	.20	.16	.17	.20	.25	.22	.21	.21
1799	L	1.504	.275	.414	14,200	34,300	22,020	54,640	2.20	22.0	1.08×.16	.173	58.2	Silky	.18	.34	*.54	.14	.14	.16	.17	.17	.20	.16
1800	C	1.505	.300	.452	14,250	31,530	23,810	52,680	2.45	24.5	1.11×.20	.222	50.8	Silky, slight lamination	.18	.30	.20	.18	.20	.25	*.68	.25	.21	.15
1801	L	1.503	.307	.461	16,280	35,310	25,440	55,180	2.07	20.7	1.06×.16	.170	63.2	Silky	*.67	.21	.15	.15	.16	.14	.14	.15	.13	.17
1802	C	1.500	.328	.492	15,470	31,440	27,200	55,280	2.21	22.1	1.17×.21	.246	50.0	do	.15	.24	*.60	.22	.18	.15	.17	.17	.14	.19
1803	L	1.510	.285	.430	16,600	38,600	24,780	57,630	1.66	16.6	1.13×.16	.180	58.1	do	.21	.19	.16	.16	.14	.15	.19	.14	.14	.18
1804	C	1.491	.296	.441	15,200	34,470	25,880	57,550	2.27	22.7	1.17×.21	.246	44.2	do	.13	.16	.17	.27	*.58	.21	.20	.18	.19	.18
1805	L	1.510	.298	.450	17,940	39,890	26,060	57,910	2.22	22.2	1.12×.18	.202	55.2	do	.24	.19	.26	*.57	.15	.16	.15	.17	.18	.15
1806	C	1.510	.315	.476	15,760	33,110	26,070	54,770	2.16	21.6	1.16×.21	.244	48.8	Silky, trace of lamination	.21	*.61	.26	.18	.13	.17	.16	.14	.15	.15
1807	L	1.502	.313	.476	16,550	34,770	26,820	56,340	1.59	15.9	1.11×.17	.189	60.3	Silky	.17	.17	.17	.17	.16	.14	.17	.16	.11	.17
1808	C	1.499	.325	.487	18,650	38,300	28,320	58,150	1.37	13.7	Broke at chisel mark.			Silky, laminated	.16	.15	.13	.14	.15	.14	.14	.12	.13	.11
1809	L	1.517	.265	.402	14,470	36,000	21,070	52,410	2.72	27.2	1.10×.13	.143	61.4	Silky	.21	.20	.36	*.67	.25	.28	.30	.18	.19	.18
1810	C	1.506	.287	.432	14,050	32,520	22,480	52,040	2.57	25.7	1.09×.17	.185	57.1	Silky, traces of lamination	.28	*.69	.25	.20	.20	.19	.19	.20	.19	.18
1811	L	1.510	.262	.426	16,720	39,250	23,910	56,180	2.28	22.8	1.14×.16	.182	59.5	Silky	.15	.14	.16	.22	*.63	.21	.18	.19	.20	.20
1812	C	1.510	.288	.435	15,580	35,820	24,610	56,570	1.53	15.3	1.14×.20	.228	45.2	do	.23	.20	.19	.16	.14	.12	.14	.13	.10	.12
1813	L	1.510	.285	.430	17,300	40,230	25,100	58,370	2.38	23.8	1.12×.17	.190	53.3	do	.16	.26	*.58	.17	.18	.15	.23	.24	.22	.19
1814	C	1.514	.295	.447	14,840	33,200	24,760	55,300	1.71	17.1	1.18×.20	.236	47.2	do	.18	.14	.19	.21	.19	.19	.16	.14	.14	.17
1815	L	1.515	.280	.424	17,520	41,320	23,640	55,750	3.04	30.4	1.09×.14	.153	64.0	do	*.78	.27	.29	.34	.25	.31	.23	.20	.23	.19
1816	C	1.514	.288	.436	15,220	34,910	21,800	50,000	1.13	11.3	Broke at chisel mark.			do	.15	.14	.13	.11	.11	.08	.10	.09	.12	.11
1817	L	1.508	.299	.451	16,600	36,810	25,810	57,280	2.29	22.9	1.12×.17	.190	57.7	do	.16	.16	.24	*.66	.20	.17	.18	.17	.18	.17
1818	C	1.510	.318	.480	17,050	34,580	26,100	54,375	1.08	10.8	Broke at chisel mark.			Silky, lamellar	.11	.11	.10	.12	.10	.12	.11	.10	.11	.10
1819	L	1.517	.300	.455	18,450	40,550	26,720	58,730	2.33	23.3	1.09×.18	.196	56.8	Silky	.17	.20	.22	.26	*.65	.26	.16	.14	.12	.15
1820	C	1.500	.300	.452	18,900	41,810	26,700	59,070	1.16	11.6	Broke at chisel mark.			do	.14	.18	.07	.12	.20	.22	.23	.20	.17	.17
1821	L	1.510	.296	.447	18,300	41,390	26,500	59,280	1.32	13.2	1.14×.16	.182	59.1	do	.19	.10	.04	.06	.11	.15	.17	.15	.19	.16
1822	C	1.507	.298	.449	18,100	40,310	26,700	59,470	1.44	14.4	Broke at chisel mark.			do	.13	.16	.17	.17	.16	.15	.16	.10	.11	.13
1823	L	1.486	.300	.446	17,100	38,340	26,200	58,950	2.64	26.4	1.08×.18	.194	56.4	Silky, slight lamination	*.64	.35	.25	.24	.22	.20	.20	.19	.17	.18
1824	C	1.512	.320	.484	19,200	39,670	27,190	56,180	1.58	15.8	1.19×.21	.250	48.3	do	.20	.17	.18	.17	.15	.15	.14	.18	.14	.15
1825	L	1.514	.293	.444	18,180	40,950	26,450	59,570	2.34	23.4	1.12×.19	.213	52.0	Silky	.19	.17	.17	.20	.26	*.65	.22	.16	.16	.16
1826	C	1.471	.313	.460	18,350	39,890	28,010	60,890	1.72	17.2	1.13×.20	.226	50.8	do	.27	.21	.19	.15	.16	.14	.15	.14	.16	.15
1827	L	1.514	.315	.477	19,050	39,940	28,880	60,550	2.28	22.8	1.16×.19	.220	53.7	Silky, slight lamination	*.58	.26	.19	.20	.21	.19	.20	.16	.14	.15
1828	C	1.521	.329	.500	18,100	36,200	28,060	56,120	1.57	15.7	1.14×.21	.239	52.1	Silky	.32	.20	.15	.15	.15	.14	.14	.13	.13	.15

* Indicates fractured section.

TENSILE TESTS OF O. H. STEEL BOILER-PLATES—Continued.

No. of test.	Mark on specimen.	Dimensions.		Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 10 inches.		Area at fracture.		Contraction of area.	Appearance of fracture.	Elongation of inch sections.									
		Width.	Thickness.		Total.	Per square inch.	Total.	Per square inch.			Dimensions.	Area.												
		Inches.	*Inch.*	*Sq.in.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Inches.*	*P. ct.*	*Inches.*	*Sq.in.*	*P. ct.*		"	"	"	"	"	"	"	"	"	"
1829	L	1.520	.314	.477	19,450	40,700	29,820	62,520	2.03	20.3	1.15×.20	.230	51.7	Silky	*.55	.19	.17	.17	.14	.15	.13	.17	.19	.17
1830	C	1.518	.330	.501	20,500	40,920	29,700	59,280	1.22	12.2	1.16×.21	.244	51.1	do	.19	.17	.13	.12	.11	.09	.09	.10	.10	.12
1831	L	1.519	.295	.448	19,780	44,150	28,280	63,125	2.96	29.6	1.12×.18	.202	55.0	Silky, slight lamination	.24	.28	*.67	.28	.24	.23	.22	.23	.31	.26
1832	C	1.519	.335	.509	20,300	39,880	31,560	62,000	1.65	16.5	1.19×.23	.274	46.2	Silky	.20	.21	.18	.13	.15	.13	.16	.18	.15	.16
1833	L	1.512	.310	.469	17,800	37,950	27,600	58,850	2.79	27.9	1.11×.19	.211	55.0	do	.28	*.66	.30	.24	.22	.20	.20	.21	.23	.25
1834	C	1.458	.356	.519	21,100	40,660	30,510	58,790	1.79	17.9	1.06×.23	.244	53.0	do	.25	.21	.20	.18	.15	.16	.17	.16	.15	.16
1835	L	1.510	.302	.456	17,200	37,720	26,710	58,570	2.12	21.2	1.12×.19	.213	53.3	do	.38	.23	.20	.21	.20	.17	.18	.19	.19	.17
1836	C	1.511	.325	.491	20,040	40,810	29,280	59,630	1.45	14.5	1.13×.21	.237	51.6	do	.22	.18	.16	.14	.14	.14	.12	.11	.11	.13
1837	L	1.522	.325	.495	18,200	36,770	29,120	58,830	2.41	24.1	1.12×.19	.213	57.0	do	.29	*.66	.25	.20	.17	.15	.16	.16	.18	.19
1838	C	1.519	.331	.503	18,700	37,180	28,140	55,940	2.22	22.2	1.10×.21	.231	54.0	do	.43	.27	.21	.20	.21	.20	.18	.19	.18	.15
1839	L	1.521	.303	.461	18,380	39,870	27,260	59,130	2.83	28.3	1.12×.19	.213	53.8	do	.24	.20	.19	.23	.23	.39	*.62	.28	.23	.22
1840	C	1.522	.328	.499	19,960	40,000	30,080	60,280	1.55	15.5	1.18×.23	.271	45.6	do	.24	.18	.16	.15	.16	.13	.15	.13	.12	.13
1841	L	1.519	.313	.475	15,120	31,830	24,960	52,550	3.19	31.9	1.10×.17	.187	60.6	do	.22	.24	.23	.27	*.73	.33	.26	.26	.32	.33
1842	C	1.521	.311	.473	14,800	31,290	25,880	54,710	2.37	23.7	1.15×.19	.219	53.8	do	.23	.25	.28	.20	.21	.21	.25	.26	.28	.25
1843	L	1.502	.312	.469	17,750	37,850	27,150	57,890	2.36	23.6	1.17×.18	.211	55.1	do	.26	*.60	.30	.21	.19	.17	.19	.16	.14	.14
1844	C	1.510	.315	.476	17,520	36,810	27,820	58,450	2.58	25.8	1.24×.23	.285	40.1	Silky, slight lamination	.27	.24	.19	.22	*.62	.25	.20	.18	.19	.22
1845	L	1.520	.311	.473	18,020	38,100	27,480	58,100	2.33	23.3	1.15×.21	.242	48.9	do	.18	.21	.21	.20	.24	*.60	.22	.16	.17	.14
1846	C	1.521	.342	.520	18,760	36,080	30,280	58,230	1.21	12.1	1.16×.22	.285	50.1	do	.14	.12	.12	.11	.12	.12	.14	.12	.11	.11
1847	L	1.520	.309	.470	15,750	33,510	26,190	55,720	3.02	30.2	1.14×.17	.198	57.8	Silky	.20	.23	.26	.27	.30	.32	*.70	.30	.25	.19
1848	C	1.518	.312	.474	17,320	36,540	27,140	57,260	2.23	22.3	1.21×.22	.266	43.8	Silky, laminated, seam ¼ inch long.	.30	.18	.15	.18	.19	.18	.20	.29	.32	.24
1849	L	1.504	.301	.453	17,680	39,030	27,090	59,800	2.71	27.1	1.10×.20	.220	51.4	Silky, slight lamination	.22	.24	.23	.23	*.60	.37	.25	.21	.18	.18
1850	C	1.504	.331	.498	18,700	37,550	30,060	60,360	1.59	15.9	1.24×.22	.273	45.2	do	.24	.18	.15	.13	.17	.17	.16	.14	.13	.12
1851	L	1.509	.307	.463	18,280	39,480	28,220	60,950	1.62	16.2	1.15×.19	.219	52.8	Silky	.22	.16	.13	.16	.15	.15	.15	.17	.17	.16
1852	C	1.503	.340	.511	19,750	38,650	31,120	60,900	1.38	13.8	1.16×.24	.278	45.5	do	.21	.17	.15	.13	.13	.12	.12	.13	.11	.11
1853	L	1.513	.311	.471	17,580	37,320	25,150	53,400	2.30	23.0	1.17×.18	.211	55.2	do	.29	.25	.24	.22	.21	.21	.22	.20	.24	.22
1854	C	1.510	.316	.477	16,760	35,140	27,570	57,800	2.48	24.8	1.11×.20	.222	53.4	do	*.64	.24	.24	.24	.15	.17	.14	.18	.24	.24
1855	L	1.512	.312	.472	15,400	32,630	24,820	52,580	1.77	17.7	1.09×.18	.196	58.4	do	.19	.20	.19	.18	.17	.16	.19	.16	.16	.17
1856	C	1.511	.315	.476	16,550	34,770	27,100	56,930	2.29	22.9	1.16×.19	.220	53.7	do	.22	.22	.23	*.52	.31	.18	.16	.16	.14	.15
1857	L	1.506	.301	.453	18,450	40,730	28,420	62,740	2.65	26.5	1.12×.20	.224	50.3	do	.26	.21	.28	*.63	.23	.21	.20	.19	.21	.23
1858	C	1.508	.326	.495	18,800	37,980	30,540	61,700	2.02	20.2	1.16×.22	.253	48.4	do	.19	*.33	*.43	.16	.17	.17	.15	.14	.15	.14
1859	L	1.505	.303	.459	18,950	41,290	26,980	58,780	2.63	26.3	1.15×.18	.207	54.9	Silky, slight lamination	.28	*.59	.27	.24	.23	.22	.22	.20	.20	.18
1860	C	1.498	.348	.521	19,200	36,850	31,190	59,870	2.11	21.1	1.25×.24	.300	42.4	Silky, seam ¼ inch long	*.52	.32	.24	.17	.15	.14	.16	.17	.12	.12
1861	L	1.516	.302	.458	19,800	43,220	27,500	60,040	2.84	23.4	1.18×.17	.201	56.1	Silky	.30	*.65	.27	.22	.18	.18	.15	.14	.12	.13
1862	C	1.498	.344	.515	19,750	38,350	31,550	61,260	2.11	21.1	1.12×.23	.258	49.9	do	*.56	.26	.19	.20	.20	.18	.16	.12	.12	.12
1863	L	1.502	.312	.469	18,280	38,980	27,480	58,590	2.89	28.9	1.08×.19	.205	56.2	do	.37	*.66	.25	.22	.23	.23	.24	.25	.21	.21
1864	C	1.504	.323	.486	20,200	41,560	29,100	59,880	2.09	20.9	1.12×.21	.235	51.6	do	.31	.53	.20	.18	.17	.15	.15	.18	.18	.14
1865	L	1.517	.290	.440	16,500	37,500	24,400	55,450	2.31	23.1	1.20×.18	.216	50.9	Silky, trace of lamination	.20	.27	*.62	.23	.17	.15	.17	.16	.16	.18
1866	C	1.517	.320	.485	19,950	41,130	28,980	59,730	1.77	17.7	1.29×.23	.297	38.7	Silky, stratified	.32	.19	.24	.16	.11	.14	.14	.14	.14	.19

* Indicates fractured section.

TENSILE TESTS OF CHAIN SPECIMENS FOR THE BUREAU OF EQUIPMENT AND RECRUITING, U. S. NAVY DEPARTMENT.

No. of test.	Marks.	Links.		Mark on studs.	Diameter of iron.	Sectional area of chain.	Tensile strength.		Fracture.	
		No.	Kind.				Total.	Per sq. inch.	Location.	Appearance.
					Inches.	*Sq. ins.*	*Pounds.*	*Pounds.*		
1907	A 2½	5	Studded.	U. S.—N. Y., W ...	2.12	7.06	289, 600	41, 020	End link in quarter weld in two places..	One-quarter weld granular 60 per cent.; fibrous 40 per cent. Opposite end opened at inside, showing granular metal.
1908	A 2½	5	...do	....do	2.08	6.80	274, 200	40, 320	First link at quarter weld	Fibrous 70 per cent.; granular 30 per cent.
1909	A 2	5	...do	....do	2.00	6.28	243, 600	38, 790	First link at weld.....	Granular 8 per cent.; following scarf 92 per cent.
1910	A 2	5	...do	....do	1.96	6.03	208, 150	34, 510	Second link at weld	Granular 10 per cent.; following scarf 90 per cent.
1911	A 2	5	...do	....do	1.98	6.16	223, 300	36, 250	.....do	Granular 10 per cent.
1912	A 1⅞	5	...do	....do	1.68	4.43	132, 100	29, 820	End link, each quarter butt.....	Granular.
1913	A 1⅞	5	...do	....do	1.73	4.70	186, 000	39, 570	First link at weld.....	Followed scarf 50 per cent.
1914	A 1⅞	5	...do	....do	1.72	4.65	180, 100	38, 730	Third link at quarter weld	Fibrous.
1915	A 1⅝	5	...do	.. do	1.64	4.22	139, 800	33, 130	Second link at weld	Do.
1916	A 1⅝	5	...do	....do	1.61	4.07	152, 600	37, 493	First link at weld	Fibrous; slight granulation.
1917	A 1⅝	5	.. do	... do	1.60	4.02	165, 600	41, 190	Third link at weld.....	Followed scarf.
1918	A 1½	5	...do	....do	1.48	3.44	138, 700	40, 320	First link at weld.....	Followed scarf 40 per cent.; fibrous 60 per cent.
1919	A 1½	5	...do	....do	1.48	3.44	133, 200	38, 720	.....do	Fibrous.
1920	A 1½	5	...do	....do	1.48	3.44	145, 400	42, 270	.....do	Fibrous; slight granulation.
1921	A 1⅜	5	...do	....do	1.37	2.95	118, 400	40, 140	Third link at quarter weld.....A.....	Fibrous.
1922	A 1⅜	5	...do	....do	1.38	2.99	125, 950	42, 120	Second link at quarter weld	Fibrous 95 per cent.; granular 5 per cent.
1923	A 1⅜	5	...do	....do	1.37	2.95	118, 300	40, 100	First link at weld.....	Granular 40 per cent.; followed weld 60 per cent.
1924	A 1¼	5	...do	....do	1.23	2.38	79, 480	33, 360	End link at side	Granular 10 per cent.; fibrous 90 per cent.
1925	A 1¼	5	...do	....do	1.22	2.34	94, 300	39, 870	Third link at quarter weld.....	Fibrous.
1926	A 1¼	5	...do	....do	1.24	2.42	94, 200	38, 930	Second link at weld	Followed scarf.
1927	A 1⅛	5	...do	....do	1.12	1.97	76, 800	38, 980	.....do	Do.
1928	A 1⅛	5	...do	....do	1.12	1.97	87, 500	44, 420	First link at weld.....	Granular 40 per cent.; followed scarf 60 per cent.
1929	A 1⅛	5	...do	....do	1.11	1.94	82, 400	42, 470	.....do	Followed scarf.
1930	A 1	7	Plain....	.....	.98	1.51	64, 250	42, 550	First link at welded end	Fibrous.
1931	A 1	5	Studded	U. S.—N. Y., W ...	.98	1.51	61, 150	40, 500	Third link at quarter weld.....	Do.
1932	A 1	7	Plain....	.....	1.00	1.57	57, 700	36, 750	Second link at welded end	Do.
1933	A 1	5	Studded	U. S.—N. Y., W ...	.98	1.51	60, 650	40, 170	Second link at weld.....	Fibrous; followed weld in part.
1934	A 1	5	...do	....do	.98	1.51	60, 500	40, 070	.....do	Fibrous 50 per cent.; followed weld 50 per cent.
1935	A 1	7	Plain....	.....	1.00	1.57	64, 900	41, 349	First link at weld.....	Fibrous 60 per cent.; followed scarf 40 per cent.
1936	A ⅞	7	...do	.....	.86	1.16	53, 420	46, 050	.....do	Fibrous.
1937	A ⅞	7	...do	.....	.85	1.13	48, 350	42, 790	First link at quarter weld.....	Do.

TENSILE TESTS OF O. H. STEEL BOILER-PLATES—Continued.

No. of test.	Mark on specimen.	Dimensions.		Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 10 inches.		Area at fracture.		Contraction of area.	Appearance of fracture.	Elongation of inch sections.									
		Width.	Thickness.		Total.	Per square inch.	Total.	Per square inch.			Dimensions.	Area.												
		Inches.	*Inch.*	*Sq.in.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Inches.*	*P. ct.*	*Inches.*	*Sq.in.*	*P. ct.*		"	"	"	"	"	"	"	"	"	"
1829	L	1.520	.314	.477	19,450	40,700	29,820	62,520	2.03	20.3	1.15×.20	.230	51.7	Silky	*.55	.19	.17	.17	.14	.15	.13	.17	.19	.17
1830	C	1.518	.330	.501	20,500	40,920	29,700	59,280	1.22	12.2	1.16×.21	.244	51.1	do	.19	.17	.13	.12	.11	.09	.09	.10	.10	.12
1831	L	1.519	.295	.448	19,780	44,150	28,280	63,125	2.96	29.6	1.12×.18	.202	55.0	Silky, slight lamination	.24	.58	*.67	.28	.24	.23	.22	.23	.31	.26
1832	C	1.519	.335	.509	20,300	39,880	31,560	62,000	1.65	16.5	1.19×.23	.274	46.2	Silky	.20	.21	.18	.13	.15	.13	.16	.18	.15	.16
1833	L	1.512	.310	.469	17,800	37,950	27,600	58,850	2.79	27.9	1.11×.19	.211	55.0	do	.28	*.66	.30	.24	.22	.20	.20	.21	.23	.25
1834	C	1.458	.356	.519	21,100	40,660	30,510	58,790	1.79	17.9	1.06×.23	.244	53.0	do	.25	.21	.20	.18	.15	.16	.17	.16	.15	.16
1835	L	1.510	.302	.456	17,200	37,720	26,710	58,570	2.12	21.2	1.12×.19	.213	53.3	do	.38	.23	.20	.21	.20	.17	.18	.19	.19	.17
1836	C	1.511	.325	.491	20,040	40,810	29,280	59,630	1.45	14.5	1.13×.21	.237	51.6	do	.22	.18	.16	.14	.14	.14	.12	.11	.11	.13
1837	L	1.522	.325	.495	18,200	36,770	29,120	58,830	2.41	24.1	1.12×.19	.213	57.0	do	.29	*.66	.25	.20	.17	.15	.16	.16	.18	.19
1838	C	1.519	.331	.503	18,700	37,180	28,140	55,940	2.22	22.2	1.10×.21	.231	54.0	do	.43	.27	.21	.20	.21	.20	.18	.19	.18	.15
18 9	L	1.521	.303	.461	18,380	39,870	27,260	59,130	2.83	28.3	1.12×.19	.213	53.8	do	.24	.20	.19	.23	.23	.39	*.62	.28	.23	.22
1840	C	1.522	.328	.499	19,960	40,000	30,080	60,280	1.55	15.5	1.18×.23	.271	45.6	do	.24	.18	.16	.15	.16	.13	.15	.13	.12	.13
1841	L	1.519	.313	.475	15,120	31,830	24,960	52,550	3.19	31.9	1.10×.17	.187	60.6	do	.22	.24	.23	.27	*.73	.33	.26	.26	.32	.33
1842	C	1.521	.311	.473	14,800	31,290	25,880	54,710	2.37	23.7	1.15×.19	.219	53.8	do	.23	.25	.23	.20	.21	.21	.25	.26	.28	.25
1843	L	1.502	.312	.469	17,750	37,850	27,150	57,890	2.86	23.6	1.17×.18	.211	55.1	do	.26	*.60	.30	.21	.19	.17	.19	.16	.14	.14
1844	C	1.510	.315	.476	17,520	36,810	27,820	58,450	2.58	25.8	1.24×.23	.285	40.1	Silky, slight lamination	.27	.24	.19	.22	*.62	.25	.20	.18	.19	.22
1845	L	1.520	.311	.473	18,020	38,100	27,480	58,100	2.33	23.3	1.15×.21	.242	48.9	do	.18	.21	.21	.20	.24	*.60	.22	.16	.17	.14
1846	C	1.521	.342	.520	18,760	36,080	30,280	58,230	1.21	12.1	1.16×.22	.285	50.1	do	.14	.12	.12	.11	.12	.12	.14	.12	.11	.11
1847	L	1.520	.309	.470	15,750	33,510	26,190	55,720	3.02	30.2	1.14×.17	.198	57.8	Silky	.20	.23	.26	.27	.30	.32	*.70	.30	.25	.19
1848	C	1.518	.312	.474	17,320	36,540	27,140	57,260	2.23	22.3	1.21×.22	.266	43.8	Silky, laminated, seam ¼ inch long.	.30	.18	.15	.18	.19	.18	.20	.29	.32	.24
1849	L	1.504	.301	.453	17,680	39,030	27,090	59,800	2.71	27.1	1.10×.20	.220	51.4	Silky, slight lamination	.22	.24	.23	.23	*.60	.37	.25	.21	.18	.18
1850	C	1.504	.331	.498	18,700	37,550	30,060	60,360	1.59	15.9	1.24×.22	.273	45.2	do	.24	.18	.15	.13	.17	.17	.16	.14	.13	.12
1851	L	1.509	.307	.463	18,280	39,480	28,220	60,950	1.62	16.2	1.15×.19	.219	52.8	Silky	.22	.16	.13	.16	.15	.15	.15	.17	.17	.16
1852	C	1.503	.340	.511	19,750	38,650	31,120	60,900	1.38	13.8	1.16×.24	.278	45.5	do	.21	.17	.15	.13	.13	.12	.12	.13	.11	.11
1853	L	1.513	.311	.471	17,580	37,320	25,150	53,400	2.30	23.0	1.17×.18	.211	55.2	do	.29	.25	.24	.22	.21	.21	.22	.20	.24	.22
1854	C	1.510	.316	.477	16,760	35,140	27,570	57,800	2.48	24.8	1.11×.20	.222	53.4	do	*.64	.24	.24	.24	.15	.17	.14	.18	.24	.24
1855	L	1.512	.312	.472	15,400	32,630	24,820	52,580	1.77	17.7	1.09×.18	.196	58.4	do	.19	.20	.19	.18	.17	.16	.19	.16	.16	.17
1856	C	1.511	.315	.476	16,550	34,770	27,100	56,930	2.29	22.9	1.16×.19	.220	53.7	do	.22	.22	.23	*.52	.31	.18	.16	.16	.14	.15
1857	L	1.506	.301	.453	18,450	40,730	28,420	62,740	2.65	26.5	1.12×.20	.224	50.3	do	.26	.21	.28	*.63	.23	.21	.20	.19	.21	.23
1858	C	1.508	.326	.495	18,800	37,980	30,540	61,700	2.03	20.3	1.16×.22	.253	48.4	do	.19	*.33	*.43	.16	.17	.17	.15	.14	.15	.14
1859	L	1.505	.305	.459	18,950	41,290	26,980	58,780	2.63	26.3	1.15×.18	.207	54.9	Silky, slight lamination	.28	*.59	.27	.24	.23	.22	.22	.20	.20	.18
1860	C	1.498	.348	.521	19,200	36,850	31,190	59,870	2.11	21.1	1.25×.24	.300	42.4	Silky, seam ¼ inch long	*.52	.32	.24	.17	.15	.14	.16	.17	.12	.12
1861	L	1.516	.302	.458	19,800	43,220	27,500	60,040	2.34	23.4	1.18×.17	.201	56.1	Silky	.30	*.65	.27	.22	.18	.18	.15	.14	.12	.13
1862	C	1.498	.344	.515	19,750	38,350	31,550	61,260	2.11	21.1	1.12×.23	.258	49.9	do	*.56	.26	.19	.20	.20	.18	.16	.12	.12	.12
1863	L	1.502	.312	.469	18,280	38,980	27,480	58,590	2.89	28.9	1.08×.19	.205	56.2	do	.37	*.66	.25	.22	.23	.25	.24	.25	.21	.21
1864	C	1.504	.323	.486	20,200	41,560	29,100	59,880	2.09	20.9	1.12×.21	.235	51.6	do	.31	.53	.20	.18	.17	.15	.15	.13	.13	.14
1865	L	1.517	.290	.440	16,500	37,500	24,400	55,450	2.31	23.1	1.20×.18	.216	50.9	Silky, trace of lamination	.20	.27	*.62	.23	.17	.15	.17	.16	.16	.18
1866	C	1.517	.320	.485	19,950	41.130	28,980	59,750	1.77	17.7	1.29×.23	.297	38.7	Silky, stratified	.32	.19	.24	.16	.11	.14	.14	.14	.14	.19

* Indicates fractured section.

TENSILE TESTS OF CHAIN SPECIMENS FOR THE BUREAU OF EQUIPMENT AND RECRUITING, U. S. NAVY DEPARTMENT.

No. of test.	Marks.	Links.		Mark on studs.	Diameter of iron.	Sectional area of chain.	Tensile strength.		Fracture.	
		No.	Kind.				Total.	Per sq. inch.	Location.	Appearance.
					Inches.	*Sq. ins.*	*Pounds.*	*Pounds.*		
1907	A 2½	5	Studded.	U. S.—N. Y., W ...	2.12	7.06	289, 600	41, 020	End link in quarter weld in two places..	One-quarter weld granular 60 per cent.; fibrous 40 per cent. Opposite end opened at inside, showing granular metal.
1908	A 2½	5	...do	....do	2.08	6.80	274, 200	40, 320	First link at quarter weld	Fibrous 70 per cent.; granular 30 per cent.
1909	A 2	5	...do	....do	2.00	6.28	243, 600	38, 790	First link at weld.....	Granular 8 per cent.; following scarf 92 per cent.
1910	A 2	5	...do	....do	1.96	6.03	208, 150	34, 510	Second link at weld	Granular 10 per cent.; following scarf 90 per cent.
1911	A 2	5	...do	....do	1.98	6.16	223, 300	36, 250	.....do	Granular 10 per cent.
1912	A 1⅞	5	...do	....do	1.68	4.43	132, 100	29, 820	End link, each quarter butt.....	Granular.
1913	A 1⅞	5	...do	....do	1.73	4.70	186, 000	39, 570	First link at weld.....	Followed scarf 50 per cent.
1914	A 1⅞	5	...do	....do	1.72	4.65	180, 100	38, 730	Third link at quarter weld	Fibrous.
1915	A 1⅞	5	...do	.. do	1.64	4.22	139, 100	33, 130	Second link at weld	Do.
1916	A 1⅞	5	...do	....do	1.61	4.07	152, 600	37, 493	First link at weld	Fibrous; slight granulation.
1917	A 1⅞	5	.. do	... do	1.60	4.02	165, 600	41, 190	Third link at weld.....	Followed scarf.
1918	A 1⅞	5	...do	....do	1.48	3.44	138, 700	40, 320	First link at weld.....	Followed scarf 40 per cent.; fibrous 60 per cent.
1919	A 1½	5	...do	....do	1.48	3.44	133, 200	38, 720	.....do	Fibrous.
1920	A 1½	5	...do	....do	1.48	3.44	145, 400	42, 270	.....do	Fibrous; slight granulation.
1921	A 1⅜	5	...do	... do	1.37	2.95	118, 400	40, 140	Third link at quarter weld.....A.....	Fibrous.
1922	A 1⅜	5	...do	....do	1.38	2.99	125, 950	42, 120	Second link at quarter weld	Fibrous 95 per cent.; grannlar 5 per cent.
1923	A 1⅜	5	...do	....do	1.37	2.95	118, 300	40, 100	First link at weld.....	Granular 40 per cent.; followed weld 60 per cent.
1924	A 1¼	5	...do	....de	1.23	2.38	79, 480	33, 360	End link at side	Granular 10 per cent.; fibrous 90 per cent.
1925	A 1¼	5	...do	....do	1.22	2.34	94, 300	39, 870	Third link at quarter weld.....	Fibrous.
1926	A 1¼	5	...do	....do	1.24	2.42	94, 200	38, 930	Second link at weld	Followed scarf.
1927	A 1⅛	5	...do	....do	1.12	1.97	76, 800	38, 980	.....do	Do.
1928	A 1⅛	5	...do	....do	1.12	1.97	87, 500	44, 420	First link at weld.....	Granular 40 per cent.; followed scarf 60 per cent.
1929	A 1⅛	5	...do	....do	1.11	1.94	82, 400	42, 470	.....do	Followed scarf.
1930	A 1	7	Plain....	.....	.98	1.51	64, 250	42, 550	First link at welded end	Fibrous.
1931	A 1	5	Studded	U. S.—N. Y., W ...	.98	1.51	61, 150	40, 500	Third link at quarter weld.....	Do.
1932	A 1	7	Plain....	.....	1.00	1.57	57, 700	36, 750	Second link at welded end	Do.
1933	A 1	5	Studded	U. S.—N. Y., W ...	.98	1.51	60, 650	40, 170	Second link at weld.....	Fibrous; followed weld in part.
1934	A 1	5	...do	....do	.98	1.51	60, 500	40, 070	.....do	Fibrous 50 per cent.; followed weld 50 per cent.
1935	A 1	7	Plain....	.....	1.00	1.57	64, 900	41, 349	First link at weld.....	Fibrous 60 per cent.; followed scarf 40 per cent.
1936	A ⅞	7	...do	.....	.86	1.16	53, 420	46, 050	.....do	Fibrous.
1937	A ⅞	7	...do	.....	.85	1.13	48, 350	42, 790	First link at quarter weld.....	Do.

TENSILE TESTS OF CHAIN SPECIMENS FOR THE BUREAU OF EQUIPMENT AND RECRUITING, ETC.—Continued.

No. of test.	Marks.	Links.		Mark on studs.	Diameter of iron.	Sectional area of chain.	Tensile strength.		Fracture.	
		No.	Kind.				Total.	Per sq. inch.	Location.	Appearance.
					Inches.	*Sq. ins.*	*Pounds.*	*Pounds.*		
1938	A ⅞	7	Plain		.86	1.16	54,700	47,160	Second link at weld	Fibrous 50 per cent.; followed scarf 50 per cent.
1939	A ¾	9	...do		.75	.883	26,670	30,200	End link of ⅞ inch iron at weld	
1940	A ¾	9	...do		.75	.883	30,680	34,750	...do	
1941	A ¾	7	...do		.75	.883	38,180	43,230	Middle link at weld	Followed scarf.
1942	A ⅝	9	...do		.60	.565	23,320	41,270	Both end links at welds	
1943	A ⅝	9	...do		.61	.584	24,680	42,260	Third link at weld and quarter weld	Fibrous.
1944	A ⅝	9	...do		.62	.604	26,380	43,680	Third link at weld	Do.
1945	XA 2	7	Studded	U. S.—N. Y., W...	1.98	6.16	252,100	40,930	First link at quarter weld	Granular 15 per cent.
1946	XA 2	7	...do	....do	1.95	5.97	243,900	40,850	Second link at weld	Slight granulation.
1947	XA 2	7	...do	....do	1.93	5.85	221,400	37,850	First link at quarter weld	Fibrous.
1948	XA 2	7	...do	....do	1.91	5.73	242,600	42,340	Second link at quarter weld	Fibrous 95 per cent.; granular 5 per cent.
1949	XA 1⅞	7	...do	....do	1.80	5.09	190,800	37,490	End link at each quarter weld, taking out a piece.	Granular.
1950	XA 1⅞	7	...do	....do	1.64	4.22	154,900	36,710	First link at weld	Fibrous.
1951	XA 1⅞	7	...do	....do	1.48	3.44	126,200	36,690	...do	Do.
1952	XA 1⅞	7	...do	....do	1.37	2.95	121,600	41,220	End link at weld	
1953	XA 1⅞	7	...do	....do	1.47	3.39	131,500	38,790	Second link at weld	Do.
1954	XA 1⅞	7	...do	....do	1.23	2.38	101,700	42,730	Third link at weld	Do.
1955	XA 1⅞	7	...do	....do	1.24	2.42	105,650	43,660	Second link at weld	Do.
1956	Wyeth, 2⅛	5	...do	....do	2.10	6.93	249,300	35,970	End link in each quarter weld	Granular.
1957	1¼" steel	5	...do	....do	1.49	3.49	163,500	46,850	First link at weld	Followed scarf.
1958	B 2	7	...do	Hawks, 1881	2.06	6.65	247,000	37,140	Second link at weld	Fibrous; 20 per cent. imperfect.
1959	B 2	7	...do	....do	2.02	6.41	256,000	39,940	First link in three places. Followed weld along scarf at side of link, and quarters of each end.	Last two fractures granular.
1960	B 1⅞	7	...do	....do	1.93	5.85	219,100	37,450	First link at side	Granular 30 per cent.
1961	B 1⅞	7	...do	....do	1.89	5.61	182,700	32,500	First link at side at weld	Followed scarf.
1962	B 1¾	7	...do	....do	1.81	5.15	206,400	40,080	Third link at side at weld	Fibrous.
1963	B 1¾	7	...do	....do	1.78	4.98	212,900	42,760	End link at side at weld	Do.
1964	B 1⅝	7	...do	....do	1.58	3.92	168,180	42,900	Second link at weld at stud	Granular 15 per cent.
1965	C 1	5	...do	Wharton R. R. Switch Co.	2.00	6.28	183,700	29,570	First link at weld	Followed scarf; weld imperfect 40 per cent.
1966	C 1	5	..do	....do	2.03	6.47	195,000	30,140	...do	Fibrous; weld imperfect 40 per cent.
1967	C 3	7	...do	....do	1.85	5.38	185,600	34,500	Fourth link at weld	Followed scarf; granular 5 per cent.
1968	C 3	7	...do	....do	1.88	5.55	196,500	35,410	Second link at weld	Followed scarf; fibrous.
1969	C 4	7	...do	....do	1.45	3.30	118,300	35,850	Fourth link at weld	Fibrous.
1970	C 4	7	...do	....do	1.48	3.44	145,000	42,150	Second link at side	Fibrous 90 per cent.; granular 10 per cent.
1971	C 5	7	.. do	....do	1.20	2.26	113,000	50,000	Third link at side	Fibrous.

1972	C 5	7	...do	....do	1.23	2.38	113,100	47,520	Second link at side	Do.
1973	D 2	5	...do	U. S.—N. Y., W ..	1.98	6.16	231,200	37,530	Third link at weld	Fibrous 95 per cent.; granular 5 per cent.
1974	D 1⅞	5	...do	....do	1.72	4.65	186,800	40,190	Second link at weld	Fibrous.
1975	D 1¾	5	...do	....do	1.49	3.49	131,080	37,560	First link at weld	Do.
1976	D 1⅝	5	...do	....do	1.25	2.45	68,900	28,120	End link at weld	
1977	D 1½	5	...do	....do	1.12	1.97	63,050	32,010	First link at weld	Fibrous 50 per cent.; followed scarf 50 per cent.
1978	D ⅞	7	Plain....	.....	.86	1.16	52,350	45,130	Second link	Followed scarf.
1979	D ¾	9	...do	.....	.75	.883	27,960	31,660	End link, ¾ inch diameter at weld	
1980	D ⅝	9	...do	.....	.60	.565	25,380	44,920	First link at quarter weld.....	Fibrous.
1981	D ½	11	...do	.....	.48	.262	15,920	43,980	Third link at quarter weld.....	Do.
1982	U. S. 35	5	Studded.	U. S —N. Y., W...	1.95	5.97	235,100	39,380	Second link at quarter weld.....	Fibrous; slight granulation.
1983	U. S. 33	5	...do	....do	1.71	4.59	173,400	37,780	Third link at weld	Followed scarf 40 per cent.
1984	U. S. 55	5	...do	....do	1.47	3.39	121,100	35,720	First link at weld	Fibrous.
1985	U. S. 44	5	...do	....do	1.24	2.42	89,760	37,070	.....do	Fibrous 40 per cent.; followed scarf 60 per cent.
1986	U. S. 8	5	...do	....do	1.12	1.97	69,500	35,280	Second link at weld	Followed scarf.
1987	U. S. 88	5	...do	....do	.98	1.51	61,060	40,440	First link at weld	Do.
1988	U. S. 7	7	Plain....	.....	.88	1.22	46,600	38,200	Second link at quarter weld.....	Fibrous.
1989	U. S. 4	7	...do	.....	.73	.837	39,100	46,710	Middle link at weld	Do.
1990	U. S. 5	9	...do	.....	.60	.565	15,450	27,350	First link at weld	Fibrous; spongy.
1991	U. S. 11	11	...do	.....	.48	.362	15,350	42,400	Fourth link at weld	Fibrous.
1992	D. B. G. 44	5	Studded.	Bradlee & Co., Philadelphia.	1.98	6.16	211,500	34,330	Middle link at side.....	Fibrous 90 per cent.; granular 10 per cent.
1993	D. B. G. 13	7	...do	....do	1.70	4.54	164,200	36,170	Third link at quarter weld.....	Fibrous 75 per cent.
1994	D. B. G. 33	9	...do	....do	1.44	3.26	124,400	38,160	First link at side	Fibrous 90 per cent.
1995	D. B. G. 14	11	...do	....do	1.23	2.38	74,500	31,300	Third link at weld.....	Fibrous 95 per cent.; granular 5 per cent.
1996	D. B. G. 18	11	...do	.....	1.10	1.90	76,500	40,260	First link at weld.....	Fibrous.
1997	D. B. G. 8	13	...do	.....	.98	1.51	54,200	35,890	Fourth link at weld.....	Do.
1998	D. B. G. 7	13	...do	.....	.85	1.13	47,800	42,300	Sixth link at quarter weld.....	Do.
1999	D. B. G. 3	21	Plain ...	.....	.74	.860	37,300	43,370	Fifth link at weld.....	
2000	D. B. G. 5	25	...do	.....	.61	.584	25,100	42,980	Seventh link at weld.....	Do.
2001	D. B. G. 4	32	...do	.....	.48	.362	12,100	33,430	Fourteenth link at weld	Do.
2002	44	5	Studded.	Bradlee & Co., Philadelphia.	1.96	6.03	188,600	31,280	End link at each quarter butt.....	One side granular; one side granular 50 per cent.
2003	13	7	...do	....do	1.74	4.76	145,400	30,550	First link each side of welded end	Granular.
2004	33	9	...do	....do	1.50	3.53	119,900	33,970	Second link at weld.....	Fibrous.
2005	14	11	...do	....do	1.27	2.53	97,200	38,420	Fifth link at weld.....	Fibrous 95 per cent.; granular 5 per cent.
2006	18	11	...do	....do	1.12	1.97	83,300	42,280	First link at side at end of weld.....	Fibrous.
2007	8	13	...do	.....	.98	1.51	59,800	39,600	Seventh link at side at end of scarf....	Do.
2008	8	17	Plain....	.....	.82	1.06	143,200	40,750	Seventh link at weld.....	Do.
2009	7	13	Studded.	.....	.84	1.11	47,700	42,970	.....do	Do.
2010	3	21	Plain....	.....	.75	.883	42,300	47,900	Sixth link at quarter weld.....	Fibrous 30 per cent.; granular 70 per cent.
2011	5	25	...do	.....	.65	.664	20,100	30,270	First link at weld.....	Fibrous.
2012	4	35	...do	.....	.48	.362	14,300	39,500	Fifth link at quarter weld.....	Do.
2013	.....	15	...do	.....	.82	1.06	31,400	29,620	Seventh link at weld.....	Do.
2014	.....	17	...do ...	.....	.67	.705	20,300	28,790	Fifth link at weld.....	Fibrous 50 per cent.; imperfect 50 per cent.
2015	.....	19	...do	.....	.62	.604	17,300	28,640	Ninth link at weld.....	Fibrous.
2016	.....	21	...do	.....	.54	.458	13,900	30,350	Eighth link at weld.....	Do.

TENSILE TESTS OF CHAIN SPECIMENS FOR THE BUREAU OF EQUIPMENT AND RECRUITING, ETC.—Continued.

No. of test.	Marks.	Links.		Mark on studs.	Diameter of iron.	Sectional area of chain.	Tensile strength.		Fracture.	
		No.	Kind.				Total.	Per sq. inch.	Location.	Appearance.
					Inches.	*Sq. in.*	*Pounds.*	*Pounds.*		
2017	.....	25	Plain....	.....	.49	.377	13,200	35,010	Second link at weld.....	Fibrous.
2018	.....	31	... do....	.....	.42	.277	9,600	34,660	Link next to end link at weld; diameter, .47 inch	Do.
2019	.....	37	... do....	.....	.36	.203	7,800	38,420	Second link at weld.....	Do.

The links of the chain in set C have enlarged cross-sections at ends as follows:
Links 2″ diameter at sides have ends 2″.25 to 2″.37 diameter.
Links $1\frac{7}{8}$″ diameter at sides have ends 2″.22 diameter.
Links $1\frac{1}{2}$″ diameter at sides have ends 1″.83 diameter.
Links $1\frac{1}{4}$″ diameter at sides have ends 1″.47 to 1″.50 diameter.

TENSILE TESTS OF WROUGHT-IRON BARS REPRESENTING THE MATERIAL FROM WHICH SOME OF THE CHAINS WERE MADE WHICH WERE TESTED FOR THE NAVY DEPARTMENT.

No. of test.	Mark on specimen.	Diameter.		Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 10 inches.		Area at fracture.		Contraction of area.	Appearance of fracture.	Elongation of inch sections.									
		Nominal.	Actual.		Total.	Per square inch.	Total.	Per square inch.			Diameter.	Area.												
		Inches.	*Inches.*	*Sq. ins.*	*Pounds*	*Pounds.*	*Pounds.*	*Pounds.*	*Inches.*	*Per cent.*	*Inches.*	*Sq. ins.*	*Per cent.*		"	"	"	"	"	"	"	"	"	"
1885	A	1⅝	1.895	2.820	93,300	33,090	150,700	53,440	2.30	23.0	1.57	1.936	31.3	Fibrous...	.21	.21	.21	.23	.22	.21	.22	.22	.25	.32
1886	A	1¾	1.728	2.345	69,600	29,680	121,800	51,940	3.30	33.0	1.27	1.267	45.9	...do.....	.25	.25	.24	.25	.27	.32	*.72	.44	.30	.26
1887	A	1½	1.505	1.779	62,200	34,960	94,650	53,220	2.89	28.9	1.15	1.039	41.6	...do.....	.22	.24	.24	.24	*.44	*.57	.25	.21	.28	.25
1888	A	1⅜	1.385	1.506	54,900	36,450	80,600	53,520	2.73	27.3	1.11	.968	35.7	...do.....	.22	.23	.23	.27	.24	.22	.23	.25	.31	*.53
1889	A	1¼	1.235	1.237	45,950	37,150	66,610	53,850	2.85	28.5	1.00	.785	36.5	...do.....	*.59	.33	.26	.24	.24	.24	.24	.23	.23	.25
1890	A	1⅛	1.140	1.021	40,900	40,060	55,720	54,570	2.34	23.4	.89	.622	39.1	...do.....	.25	.23	.22	.23	.25	.22	.25	.24	.22	.23
1891	A	1	.880	.608	26,750	44,000	32,900	54,210	2.40	24.0	.65	.332	45.4	...do.....	.22	.20	.18	.29	*.51	.20	.20	.20	.20	.20
1892	D	1¼	1.275	1.277	44,400	34,770	61,810	49,970	2.29	22.9	1.03	.833	34.8	...do.....	.33	.24	.23	.22	.22	.19	.19	.20	.22	.25
1893	D	1⅛	1.128	.999	37,400	37,440	53,090	53,140	2.56	25.6	.88	.608	39.1	...do.....	.35	.26	*.48	.21	.20	.20	.21	.24	.22	.19
1894	D	1⅛	1.130	1.003	37,350	37,240	53,100	52,940	2.50	25.0	.88	.608	39.4	...do.....	.22	.23	.22	.20	.21	.24	*.51	.27	.20	.20
1895	D	1	.880	.608	25,300	41,610	32,480	53,420	1.61	16.1	.76	.454	25.3	...do.....	.21	*.27	.13	.16	.14	.14	.14	.14	.15	.13
1896	D	1	.880	.608	24,980	41,090	32,540	53,520	2.52	25.2	.70	.385	36.7	...do.....	.22	*.48	.24	.23	.21	.21	.21	.25	.25	.22
1897	D	⅞	.620	.302	12,800	42,380	16,400	54,300	2.55	25.5	.47	.173	42.7	...do.....	.21	.20	.21	.22	.23	.22	.24	*.46	.31	.25
1898	D	½	.500	.196	7,780	39,690	9,920	50,610	2.23	22.3	.40	.126	35.7	...do.....	.19	.21	.24	.22	.22	.24	*.39	.21	.19	.22
1899	D	½	.500	.196	8,150	41,580	10,600	54,080	1.94	19.4	.39	.119	39.2	...do.....	.18	.19	.20	.18	.20	.20	.19	.19	.22	.19
1900	44	1¼	1.252	1.231	41,150	33,430	62,530	50,800	2.86	28.6	1.00	.785	36.2	...do.....	*.35	*.48	.26	.22	.25	.19	.27	.25	.23	.26
1901	8	1⅛	1.120	.985	34,700	35,230	51,060	52,450	2.06	20.6	.86	.581	41.0	...do.....	.26	.22	.20	.22	.20	.21	.19	.19	.19	.18
1902	8	1⅛	1.120	.985	34,680	35,210	51,450	52,200	2.62	26.2	.86	.581	41.0	...do.....	.28	*.53	.37	.24	.21	.19	.20	.19	.19	.22
1903	88	1	1.000	.785	28,250	35,990	40,760	51,920	2.75	27.5	.77	.466	40.6	...do.....	.25	.25	*.55	.30	.25	.24	.23	.24	.21	.23
1904	88	1	1.000	.785	28,500	36,310	40,780	51,950	2.77	27.7	.75	.442	43.7	...do.....	.21	.21	.23	.23	.26	*.56	.30	.27	.23	.27
1905	7	⅞	.880	.608	24,950	41,040	32,360	53,220	2.19	21.9	.70	.385	36.7	...do.....	.25	*.38	.19	.19	.21	.20	.19	.20	.19	.19
1906	5	⅝	.620	.302	12,900	42,720	16,380	54,240	2.29	22.9	.49	.189	37.4	...do.....	*.40	.25	.23	.22	.21	.21	.20	.18	.18	.21

Where * is not shown in elongation of inch sections, fracture occurred outside the gauged section.

TENSILE TEST OF SHOT LINES FOR THE U. S. LIFE-SAVING SERVICE.

No. of test.	Marks on specimens.	Description.	Tensile strength.	Elongation in 6 feet.	
				Inches.	Per cent.
707	Scotch gill-twine No. 1	3 strands, 6 threads each, twisted, $\frac{1}{8}$-inch diameter	*Pounds.* 198	$3\frac{1}{8}$	4.9
708	do	do	216	4	5.6
709	do	do	218	4	5.6
710	Scotch gill-twine No. 2	do	201	$4\frac{1}{8}$	6.25
711	do	do	204	$4\frac{1}{4}$	5.9
712	do	do	210	$4\frac{1}{8}$	6.25
713	Silver Lake linen, No. 7, unbleached	13 strands, 7 threads each, braided, .22-inch diameter	448	$11\frac{1}{8}$	16.
714	do	do	452	12	16.7
715	do	do	450	$11\frac{3}{4}$	16.3
716	Sylvan Spring linen, No. 7, unbleached	15 strands, 2 threads each, braided, .22-inch diameter	484	8	11.1
717	do	do	435	$7\frac{7}{8}$	10.4
718	do	do	474	8	11.1
750	Scotch gill-twine	3 strands of 19 threads each, very loosely laid	410	4	5.6
751	do	do	412	4	5.6
752	do	do	416	4	5.6

RUNNERS OF STEEL CASTINGS RECEIVED FROM COMMODORE S. B. LUCE, U. S. NAVY.

No. 1174.

Diameter, ".504.
Sectional area, .20 square inch.
Gauged length, 3".00.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000133	.000133	0.	.....	
2,000	10,000	.000333	.000200	0.	.....	
3,000	15,000	.000500	.000167	0.	.....	
4,000	20,000	.000667	.000167	.000067	.000067	
5,000	25,000	.000867	.000200	.000067	0.	
6,000	30,000	.001033	.000166	.000067	0.	
6,200	31,000	.001067	.000034	.....	.....	
6,400	32,000	.001133	.000066	.....	.....	
6,600	33,000	.001167	.000034	.....	.....	
6,800	34,000	.001233	.000066	.....	.....	
7,000	35,000	.001300	.000067	.000233	.000166	
7,200	36,000	.001400	.000100	.....	.....	
7,400	37,000	.001500	.000100	.....	.....	
7,600	38,000	.001567	.000067	.....	.....	
7,800	39,000	.001667	.000100	.....	.....	
8,000	40,000	.001833	.000166	.000500	.000267	
8,200	41,000	.002000	.000167	.....	.....	
8,400	42,000	.002100	.000100	.....	.....	
8,600	43,000	.002233	.000133	.....	.....	
8,800	44,000	.002433	.000200	.....	.....	
9,000	45,000	.002767	.000334	.001167	.000667	
9,200	46,000	.003000	.000233	.....	.....	
9,400	47,000	.003233	.000233	.....	.....	
9,600	48,000	.003500	.000267	.....	.....	
9,800	49,000	.003867	.000367	.....	.....	
10,000	50,000	.004333	.000466	.002533	.001306	
11,000	55,000	.0067	.002367	.....	.....	
12,000	60,000	.0100	.0033	.....	.....	
13,000	65,000	.0133	.0033	.....	.....	
14,000	70,000	.0167	.0034	.....	.....	
15,000	75,000	.0217	.0050	.....	.....	
16,000	80,000	.0250	.0033	.....	.....	
17,000	85,000	.0333	.0083	.....	.....	
18,000	90,000	.0400	.0067	.....	.....	
18,560	92,800	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	92,800
Elastic limit per square inch of original section about	do....	35,000
Elongation per inch after rupture	inch..	0.0400
Reduction in diameter at point of rupture	do....	.014
Reduction in area after rupture, per centum of original section		5.7
Position of rupture		".80 from neck.
Character of broken surface		granular, dull-colored spot near center.
Elongation of inch sections		".08", ".04, ".02

No. 1175.

Diameter, ″.497.
Sectional area, .194 square inch.
Gauged length, 2″.00
Numerous blow-holes in stem, on account of which micrometer readings of the elongations were not taken.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds. 18,480	*Pounds.* 95,260	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	95,260
Elongation per inch after rupture	inch..	0.0300
Reduction in diameter at point of rupture	do....	.012
Reduction in area after rupture, per centum of original section		4.6
Position of rupture		½ inch from nick at blow-hole.
Character of broken surface		granular, dull-colored spot near the center.
Elongation of inch sections		.″05*, .″01

CARTRIDGE METAL FROM FRANKFORD ARSENAL.

No. 781.

COPPER.

Sectional area, ″.86 × ″.0930 = .071 square inch.
Elastic limit, 890 pounds = 12,591 pounds per square inch.
Tensile strength, 2,710 pounds = 38,341 pounds per square inch.
Elongation in 5 inches, 2″.2 = 44 per cent.
Elongation of inch sections, ″.14, ″.62*, ″.41, ″.37, ″.36.
Area at fracture, ″.54 × ″.055 = .030 square inch.
Contraction, 57.7 per cent.
Compact metal at fracture.

No. 782.

ALUMINUM BRONZE.

Sectional area, ″.76 × ″.090 = .068 square inch.
Elastic limit, 1,820 pounds = 26,608 pounds per square inch.
Tensile strength, 3,380 pounds = 49,415 pounds per square inch.
Elongation in 5 inches, 2″.24 = 44.8 per cent.
Elongation of inch sections, ″.35, ″.37, ″.41, ″.45, ″.66*.
Area at fracture, ″.55 × ″.049 = .027 square inch.
Contraction, 60.3 per cent.
Laminated fracture.

COMPRESSION OF VARIOUS SUBSTANCES

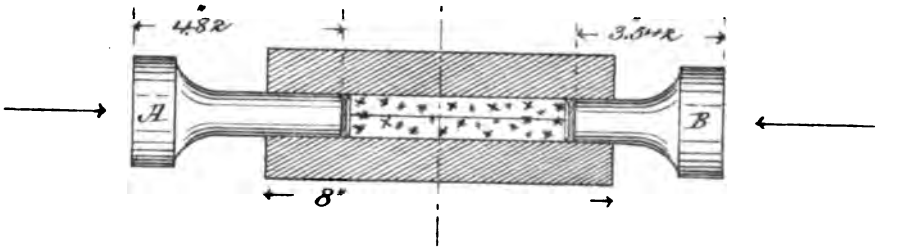
FOR THE

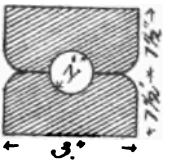
U. S. GEOLOGICAL SURVEY.

MATERIAL CONFINED IN CYLINDER WITH CLOSED ENDS.

1755

Sketch of retaining cylinder and pistons.





M Ex 31 49 2

No. 680.

Test lead, granulated, C. P.

Cylinder charged with paper-covered cartridge of 7,810 grains weight.

Applied loads.		Length of lead column.	Remarks.
Total.	Per square inch.		
Pounds.	*Pounds.*	*Inches.*	
0	0	6.82	
1,000	1,273	5.48	
5,000	2,546	4.85	
8,000	6,366	4.62	
8,000	10,186	4.27	
10,000	12,732	4.05	
12,000	15,278	3.91	
14,000	17,825	3.84	

Stroke of plunger A exhausted.

Plunger withdrawn and additional material placed in the cylinder. (Copper checks over ends of original cartridge remaining in the cylinder.)

Loads again applied.

Applied loads.		Length of lead column.	Remarks.
Total.	Per square inch.		
Pounds.	*Pounds.*	*Inches*	
1,000	1,273	6.57	
2,000	2,546	5.95	
3,000	3,820	5.74	
4,000	5,093	5 61	
5,000	6,366	5.51	
8,000	10,186	5.39	
10,000	12,732	5.36	
12,000	15,278	5.35	
14,000	17,825	5.35	
20,000	25,464	5.31	
25,000	31,830	5.19	
30,000	38,196	5.17	
40,000	50,928	5.14	
50,000	63,660	5.11	
60,000	76,392	5.10	
70,686	90,000	5.06	
76,000	96,766	5.03 5.02	After sustaining the pressure 2 minutes.

Cylinder opened and lead found to be in a coherent mass, but not welded or fused.

Lead column easily broken transversely, grains crumble off the fractured ends.

No. 681.

Antimony (commercial) ground to pass through sieve 2,304 meshes per square inch. Wire of sieve, ".006 diameter.
Quantity in cartridge, 4,710 grains weight.

Applied loads.		Length of antimony column.	Remarks.
Total.	Per square inch.		
Pounds.	*Pounds.*	*Inches.*	
2,000	2,546	5.64	
3,000	3,820	5.57	
4,000	5,093	5.46	
5,000	6,366	5.37	
6,000	7,639	5.28	
7,000	8,912	5.20	
8,000	10,186	5.13	
10,000	12,732	5.01	
12,000	15,278	4.92	
14,000	17,825	4.84	
16,000	20,371	4.76	
20,000	25,464	4.63	
25,000	31,830	4.50	
30,000	38,196	4.40	
40,000	50,928	4.23	
50,000	63,660	4.10	
60,000	76,392	3.98	
70,686	90,000	3.91	
76,000	96,766	3.87	

Material compressed into a coherent mass of low tenacity.

No. 682.

Calcite, powdered.

Quantity in cartridge, 1,900 grains weight.

Applied loads.		Length of calcite column.	Remarks.
Total.	Per square inch.		
Pounds.	*Pounds.*	*Inches.*	
3,000	3,820	5.35	Initial load.
4,000	5,093	5.05	
5,000	6,366	4.91	
6,000	7,639	4.74	
7,000	8,912	4.68	
8,000	10,186	4.59	
10,000	12,732	4.48	
12,000	15,278	4.40	
14,000	17,825	4.35	
16,000	20,371	4.30	
20,000	25,464	4.23	
25,000	31,830	4.14	
30,000	38,196	4.08	
40,000	50,928	4.01	
50,000	63,660	3.94	
60,000	76,392	3.88	
70,686	90,000	3.83	
76,000	96,766	3.80	

Material compressed into a coherent mass of low tenacity.

No. 683.

Charged cylinder with substances in the following order, from north to south ends:

1.

Antimony, powdered, in paper cartridge case, with open end (previously compressed).

2.

A—Wax.

3.

Paraffine.

4.

Bismuth, powdered, in paper cartridge case, with closed ends.

5.

B—Paraffine.

6.

Lead, in paper cartridge case, with open end (previously compressed).

On wax A was laid a silver 3-cent piece, and a wire staple pressed into the upper side. On paraffine B a coin and staple were similarly placed.

7,600 pounds = 96,766 pounds per square inch was applied and sustained a period of five minutes.

Upon opening the cylinder the above substances were found in the same relative order as when first introduced. The coins and staples remained at the upper side of the column; the coins were bent to the curvature of the cylinder, and were pressed against the upper half of the cylinder with such force as to leave an impression of their relief work on the wall of the cylinder. Coin B rested in part upon the lead and in part upon the paraffine.

No. 684.

Cylinder charged as follows:

Material in cartridges with paper covering, closed ends.

	Grains.
Chloride of potassium (KCl)	360
Chloride of sodium (NaCl)	500
Sulphur (S)	400
Chloride of ammonium (NH_4Cl)	300

These substances were submitted to a pressure of 76,000 pounds on piston = 96,766 pounds per square inch, and remained under pressure five minutes.

When removed from the testing machine, the sulphur, chlorides of potassium and sodium were found in coherent masses, not fused. The chloride of ammonium somewhat resembled paraffine in appearance; when broken, however, was flaky at fractured surface.

No. 685.

Cylinder charged with the following substances in paper-covered cartridges:

	Grains.
Carbonate of soda, dry (Na_2CO_3)	500
Sulphate of soda ($NaSO_4$)	560
Sulphate of zinc ($ZnSO_4$)	500
Sulphate of copper ($CuSO_4$)	460

Under 50,000 pounds (total) compression leakage of the cylinder began. Vapor from $NaSO_4$ escaped through the joint of the halves of the cylinder.

Rapidly increasing the pressure 76,000 pounds = 96,700 pounds per square inch was reached, water continuing to escape.

Removed from the cylinder, Na_2CO_3 was reduced to a compact mass. $NaSO_4$ had parted with its water. $ZnSO_4$ and $CuSO_4$ were apparently unchanged otherwise than pressed into coherent masses. The sulphate of copper could be reduced by pressure of the hands to the pulverized condition it was in before testing.

No. 586.

Cylinder now charged with the following substances in paper-covered cartridges:

	Grains.
Glass, powdered	560
Resin	230
Zinc and sulphur	800
Borax	300

The glass was apparently unaffected by the pressure of 76,000 pounds = 96,766 pounds per square inch; it was loose powder afterward.

The other substances were pressed into coherent masses, the zinc and sulphur remaining in a state of mechanical mixture.

TESTS MADE FOR PRIVATE PARTIES FROM JULY 1, 1885, TO JUNE 30, 1886.

Date.	Material.	For whom tested.		
		Name.	City.	State.
1885.				
July 3	9 cubes terra-cotta	Boston Terra-Cotta Company	Boston	Mass.
7	1 cube stone	Norcross Brothers	do	Mass.
13	Car couplers	McConway & Torley	Pittsburgh	Pa.
13	3 wrought-iron stay bolts	Schenectady Locomotive Works	Schenectady	N. Y.
18	2 pieces steel plate	William Allen & Sons	Worcester	Mass.
18	4 pieces steel plate	Park Brother & Co	Pittsburgh	Pa.
22	Wrought-iron bar	Putnam Machine Company	Fitchburg	Mass.
30	4 cubes terra-cotta	Cyrus L. W. Eidlitz	New York	N. Y.
31	do	Boston Terra-Cotta Company	Boston	Mass.
31	4 cubes granite	Keene Granite Company	do	Mass.
Aug. 3	1 bar wrought-iron	Prof. Thomas Egleston	New York	N. Y.
4	do	do	do	N. Y.
4	1 bar steel	do	do	N. Y.
4	8 pieces steel plate	Robinson Boiler Works	Boston	Mass.
4	6 riveted joints	do	do	Mass.
4	2 wrought-iron links	Kinsley Iron and Machine Company.	Canton	Mass.
21	Cast-iron gear tooth	William A. Harris	Providence	R. I.
24	12 cubes terra-cotta	Boston Terra-Cotta Company	Boston	Mass.
31	8 pieces steel	Pennsylvania Railroad	Altoona	Pa.
Sept. 1	1 piece steel	do	do	Pa.
1	3 railroad spikes	J. Bradford	Chelsea	Mass.
7	2 steel hooks	Charles Schryzer, agent	Kansas City	Mo.
28	2 pieces wire rope	Metallic Splice Manufacturing Company.	Boston	Mass.
Oct. 14	8 pieces rope	Standard Cordage Company	do	Mass.
14	2 railroad spikes	J. G. Low	Chelsea	Mass.
Dec. 26	2 pieces steel plate	I. P. Morris & Co	Philadelphia	Pa.
26	6 castings	Golding & Co	Boston	Mass.
1886.				
Jan. 6	2 cubes sandstone	Norcross Brothers	do	Mass.
6	3 specimens wrought-iron	Wheeler Metal Company	do	Mass.
7	9 pieces rope	Standard Cordage Company	do	Mass.
7	18 pieces sheeting	James A. Tilden	do	Mass.
8	1 piece aluminum bronze	South Boston Iron Works	South Boston	Mass.
27	1 piece steel plate	Lloyd & Symes	Boston	Mass.
28	4 pieces copper wire	D. H. Bishop	do	Mass.
Feb. 25	2 pieces oriental metal	Oriental Metal Company	do	Mass.
26	10 pieces aluminum bronze	Cowles E. S. & Aluminum Company.	Cleveland	Ohio.
27	4 pieces aluminum bronze	do	do	Ohio.
Mar. 18	2 steel angle bars	Missouri Pacific Railway	Athens	Pa.
19	do	do	do	Pa.
19	Wire-rope clutch	F. P. Canfield	Boston	Mass.
19	1 bar wrought-iron	Concord Axle Company	Penacook	N. H.
19	3 pieces steel plate	Lloyd & Symes	Boston	Mass.
19	do	Rhode Island Locomotive Works	Providence	R. I.
20	9 pieces steel plate	Robinson Boiler Works	Boston	Mass.
20	3 riveted joints	Rhode Island Locomotive Works	Providence	R. I.
20	11 riveted joints	Robinson Boiler Works	Boston	Mass.
22	4 pieces steel plate	Pennsylvania Railroad	Altoona	Pa.
27	1 riveted joint	do	do	Pa.
29	3 riveted joints	do	do	Pa.
30	do	do	do	Pa.
31	5 riveted joints	do	do	Pa.
Apr. 1	4 riveted joints	do	do	Pa.
1	6 riveted joints	H. S. Robinson	Boston	Mass.
1	4 pieces steel plate	do	do	Mass.
8	4 bricks	Fred. Pope	do	Mass.
9	1 latticed column	Kentucky and Indiana Bridge Company.	Louisville	Ky.
10	do	do	do	Ky.
12	do	Saint Paul and Northern Pacific Railway Company.	Minneapolis	Minn.
13	do	do	do	Minn.
14	do	do	do	Minn.
17	2 steel eye-bars	Dominion Bridge Company	Montreal	P. Q.
23	3 steel eye-bars	do	do	P. Q.
26	do	do	do	P. Q.
28	1 steel eye-bar	do	do	P. Q.
	2 pieces steel	do	do	P. Q.
27	2 steel eye-bars	Saint Paul and Northern Pacific Railway Company.	Minneapolis	Minn.
28	1 steel eye-bar	do	do	Minn.
June 9	1 cube stone	Roxbury Stone Company	Boston	Mass.

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No. 13	451
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